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INSTRUCTION MANUAL

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228 W. Florenc
Inglewood, Calif.

EMPIRE*

NOISE AND FIELD

INTENSITY METER

MODEL NF-205

S/N U-10761

Electronic Services - Los Angeles
M14830X

SINGER
INSTRUMENTATION

INSTRUCTION MANUAL

ANT. COUP. FACTOR
V.A - 205 ANT.
V.P. 205-SC
FIG. 7 PG 24

GENERAL ELECTRIC CO.
Instrumentation & Control
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NOISE AND FIELD INTENSITY METER

MODEL NF-205

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ADDENDUM

for

MODEL NF-205
NOISE AND FIELD INTENSITY METER

I. PURPOSE.

To make instruction manual agree with lastest schematic diagrams.

II. ADDENDUM.

a. On page 40, line 4: change "5875" to "5784".

b. On page 40, line 6: change tuned stages using 6BJ6 tubes." to "tuned stages using a 6CB6 tube at the input stage and 6BJ6 tubes on the remaining three stages".

c. On page 41, paragraph 7, line 10: change "1N21B" to "1N21C".

d. On page 42, line 8, change "1N21B" to "1N21C".

e. On page 45, paragraph 2.2, line 4: change "connector J7, which is the lower of the two connectors on the tuning unit panel..." to "connector J1".

f. On page 46, paragraph 2.3, line 2: change "into the upper antenna connector(J10) on the unit." to "into the antenna connector(J1) on the unit."

g. On page 46, paragraph 3.1, line 3: change "P203" to "J205".

h. On page 47, paragraph 3.2, line 6: change "Peak trimmers C1 and C2." to "Peak trimmer C2."

i. On page 48, line 1: change "P601" to "P610".

j. On page 48, line 3: change "J601" to "J610".

k. On page 48, lines 6 and 7: change "Reconnect IF connector P601 to J601. Feed an RF signal of 400 MC into the 400-700 MC input connector on..." to "Reconnect IF connector P610 to J610. Feed an RF signal of 400 MC into input connector J601 on ...".

l. On page 48, paragraph 4.2, lines 7 and 8: change "connector J605, which is the lower of two connectors on the fron panel." to "connector J601".

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TA/NF-205	
T1/NF-205	
T2/NF-205	
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BA/NF-205	

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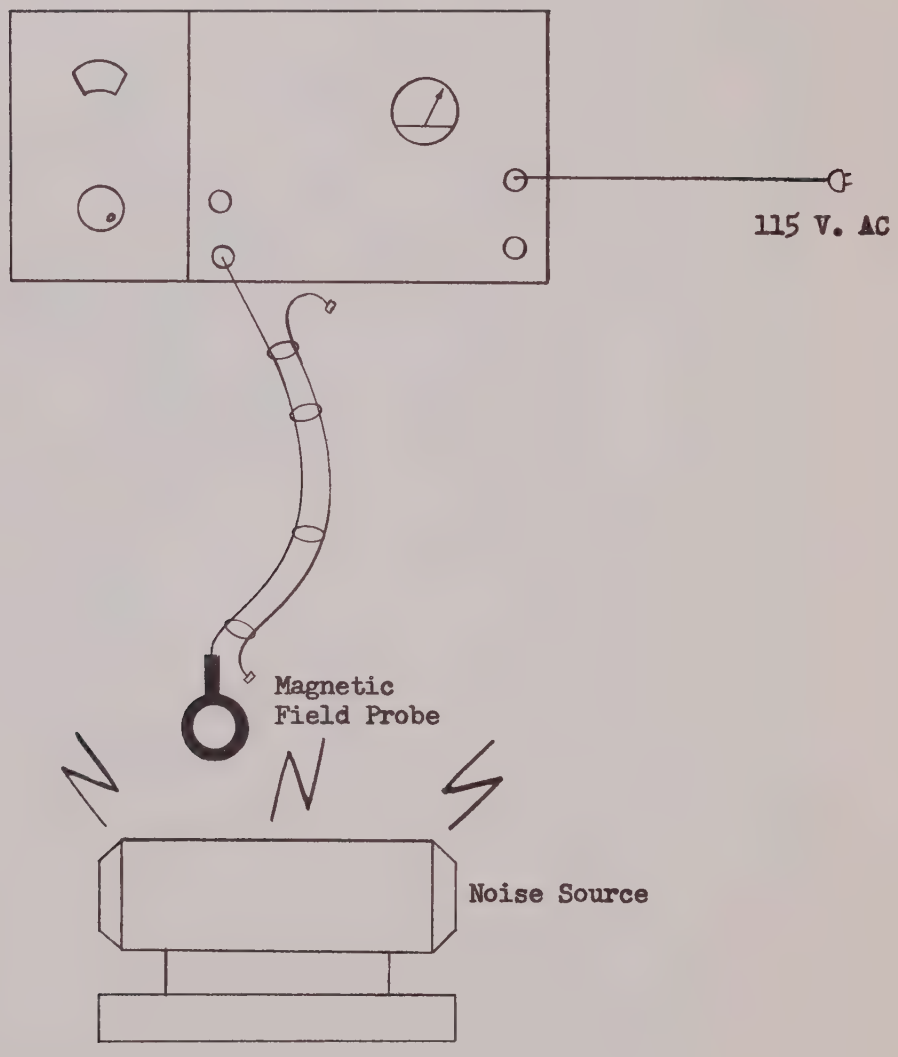


FIGURE 1

Typical Application

of NF-205

PART ONE - INTRODUCTION

SECTION I

Description of Noise and Field Intensity Meter Model NF-205

1. General

Noise and Field Intensity Meter NF-205 is intended for use in the frequency range from 150 KC to 1000 MC. This frequency range is covered by means of four plug-in tuning heads which house the R.F. and I.F. circuits. The basic measuring unit contains detectors and audio circuits, calibrating standard, attenuators and indicating circuits as well as a voltage regulated power supply. Antennas, magnetic, electric and line probes, injection blocks, cables and carrying cases are available. Inverters for DC operation, a broadband antenna set and a remote indicating meter may be had as optional equipment.

2. Application

Model NF-205 provides a compact, lightweight, portable noise and field strength meter for measurements of interference originating in electrical and electronic equipment and of electrical field strength. A built-in impulse noise generator is used as a calibrating standard for noise and carrier measurements. Readings may be taken using a visual indicator (meter) or by aural means (slideback method). Figure 1 illustrates a typical application of the instrument.

3. Technical Characteristics

POWER REQUIREMENTS:	105-130 volts, 50 to 60 cycles (96VA) or 12 or 24 volts DC (190 watts).
VOLTAGE REGULATION:	"A" and "B" supply regulated for operation from 105 to 125 volts AC or 11.5 to 15 volts DC (23 to 30 volts DC respectively).
FREQUENCY RANGE:	150 KC to 1000 MC using four plug-in units. Tuning Unit T-A/NF-205 covers the range from 150 KC to 30 MC in six bands: Tuning Unit T-1/NF-205 covers the range from 20 to 200 MC in two bands; Tuning Unit T-2/NF-205 covers the range from 200 to 400 MC in one band; Tuning Unit T-3/NF-205 covers the range from 400 to 1000 MC in two bands.
VOLTAGE RANGE AS A TWO-TERMINAL R.F. VOLTMETER:	Interference measurements: $\frac{1}{BW(MC)}$ to $\frac{100,000}{BW(MC)}$ microvolts/MC Carrier Intensity Measurements: 1 to 100,000 microvolts.

INPUT IMPEDANCE:	50 ohms
CALIBRATING IMPULSE NOISE SOURCE:	Pulse Repetition Rate: fixed at power line frequency. Spectrum: flat to 1000 MC within 1-1/2 DB. Pulse Amplitude: variable from -10 to +81 DB above 1 microvolt/megacycle bandwidth.
INDICATING METER:	4-1/2" logarithmic movement calibrated in microvolts and decibels.
WEIGHT:	Approximately 70 lbs. with one tuning unit.
SIZE:	The basic measuring unit is 18-3/4" wide x 9-1/2" high x 14-5/8" deep.

4. List of Components

The following list of components are available for Noise and Field Intensity Meter Model NF-205.

Quantity	Name of Component	Catalog No.
1	Basic Measuring Unit (See Note 1)	BA-205
1	Tuning Unit, 150 KC to 30 MC	T-A/NF-205
1	Tuning Unit, 20 MC to 200 MC	T-1/NF-205
1	Tuning Unit, 200 MC to 400 MC	T-2/NF-205
1	Tuning Unit, 400 MC to 1000 MC	T-3/NF-205
1	R.F. Patch Cord (6 inch)	
1	Standard Accessory Kit, 20-1000 MC, consisting of items (a) through (o) (See Note 2)	KT-205-D
	(a) Accessory Carrying Case	AC-205C
	(b) Dipole Antenna Set (20-200 MC) (See Note 3)	DM-205-T1
	(c) Dipole Antenna Set (200-400 MC) (See Note 3)	DM-205-T2
	(d) Dipole Antenna Set (400-1000 MC) (See Note 3)	DM-205-T3
	(e) Line Probe (50 ohms)	LL-205
	(f) Magnetic Field Probe	MP-205
	(g) Electric Field Probe	EP-205-A
	(h) Two each 30 Ft. R.F. Cables	CB-205
	(i) Earphones	EA-205
	(j) Grounding Strap	GR-205
	(k) Three each Antenna Masts	MA-205
	(l) Mast Socket	MS-205-A
	(m) Tripod	TP-205-A
	(n) Tripod Bag	BG-205
	(o) Carrying Case for a Tuning Unit	TC-205

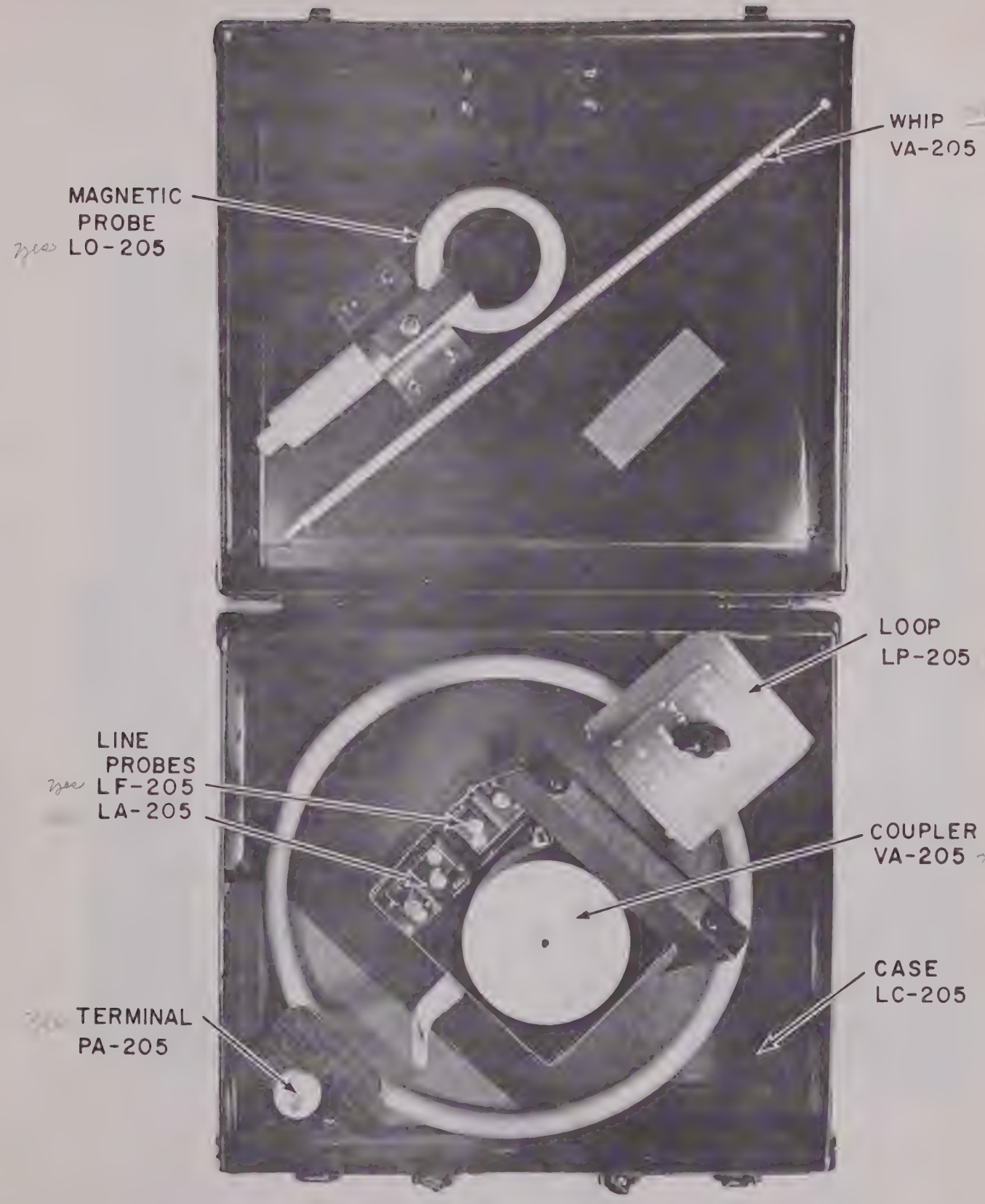
Quantity	Name of Component	Catalog No.
1	Antenna Equipment for T-A/NF-205, consisting of the following items:	LM-205
	(a) Carrying Case	LC-205
	(b) Loop Antenna	LP-205
	(c) Vertical Antenna	VA-205
	(d) Magnetic Probe	LO-205
	(e) Line Probe (50 ohms)	LA-205
	(f) Line Probe (500 ohms)	LF-205
	(g) High Impedance Binding Post	PA-205
1	Broadband Antenna Set (20-1000 MC) (See Note 4)	BB-205
1	Unbalanced Injection Block	UN-205
1	Inverter for 12 V. DC Operation	MO12-205
1	Inverter for 24 V. DC Operation	MO24-205
1	DC Supply Cord	DC-205
1	Remote Indicator	RE-205
1	Remote Indicator Cable	RC-205
1	Line Probe (500 ohms)	LH-205
1	Carrying Case for Additional Accessories	OC-205

Note 1: The basic measuring unit must be used in conjunction with a tuning unit.

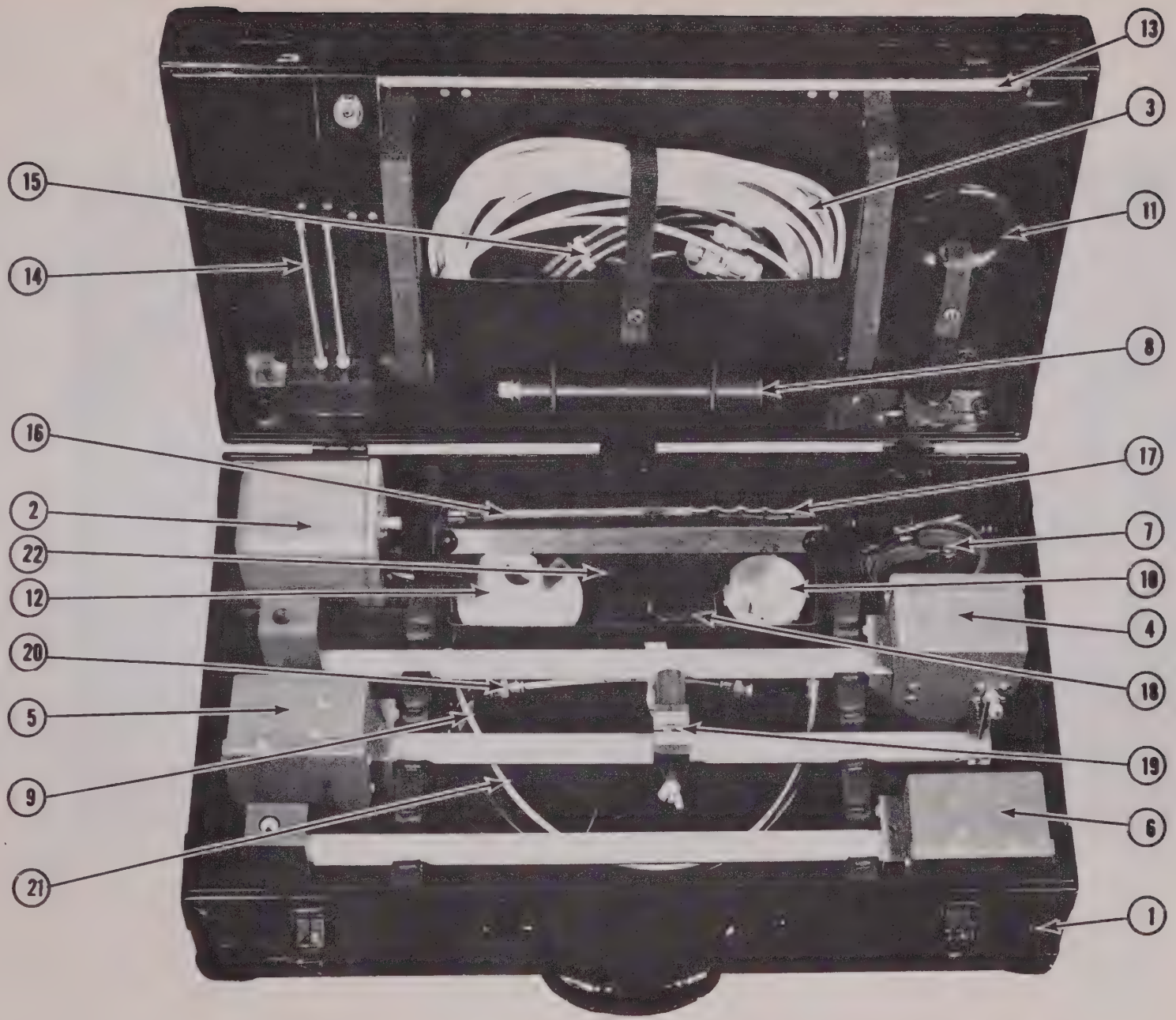
Note 2: All items including (a) to (o) may be ordered separately.

Note 3: Dipole Antenna Sets SM-205-T1, DM-205-T2 and DM-205-T3, must be used in conjunction with antenna masts and mast socket.

Note 4: Broadband Antenna Set Model BB-205 must be used in conjunction with Unbalanced Injection Block Model UN-205



ARRANGEMENT OF COMPONENTS IN LM-205



ARRANGEMENT OF COMPONENTS IN KT-205

STANDARD ACCESSORY KIT KT-205, CONSISTING OF THE FOLLOWING:

1.	AC-205-C	Accessory Carrying Case
2.	AH-205	Alignment Harness
3.	CB-205	2 - 30 ft. Cables
4.	DM-205-T1	Dipole Antenna
5.	DM-205-T2	Dipole Antenna
6.	DM-205-T3	Dipole Antenna
7.	EA-205	Earphones
8.	EP-205-A	Electric Probe
9.	GR-205	Grounding Strap
10.	LL-205	Line Probe
11.	MP-205	Magnetic Probe
12.	MS-205-A	Mast Socket
13.		Long Dipole Arms
14.		Short Dipole Arms
15.		AC Line Cord
16.		1,000 MC Rule
17.		Allen Wrenches
18.		Tape Measure Rule
19.		Clamp Block
20.		6" Patch Cord
21.		18" Patch Cord
22.		Instruction Manual
23	CP-205	Clamp-on Probe

5. Description of Major Components

The basic measuring unit of Noise and Field Intensity Meter Model NF-205, in conjunction with the four plug-in tuning units, contains all tubes and associated circuits. It is housed in an aluminum case provided with a gasketed front cover.

Of the four plug-in units available, one is normally carried plugged into the main unit. The other three units may be stored in carrying cases.

For three of the Tuning Heads (T-1/NF-205, T-2/NF-205 and T-3/NF-205), there is a corresponding dipole antenna set consisting of a balun transformer and dipole arms. A mounting base and three extension mast rods are provided to mount any of the dipole antennas on the tripod.

The Vertical Antenna VA-205 which is used with Tuning Unit T-A/NF-205, consists of a 41" collapsible rod mounted on top of its coupler. The coupler contains six autotransformers, whose 50 ohm output is connected to the instrument through a six position switch. Similarly, the LP-205 is mounted on a coupler containing the appropriate matching networks. These are also selected for the proper frequency range with a six position switch.

The broadband antenna consists of a cone equipped with fittings for extension rods, six extension rods and a ground plane.

All antennas may be mounted on the adjustable wooden tripod.

Two magnetic field probes are available. One probe, the Model MP-205, covers the frequency range of 20-1000 MC and is contained in Standard Accessory Kit KT-205-D. The other, Model LO-205, covers the range of 150 KC-20 MC and is a component of Antenna Equipment Model LM-205. Both probes consist of a three inch electrostatically shielded pick-up loop attached to a handle. In order to minimize shock hazard, the probe is insulated. Since both models are of the same physical appearance, Model LO-205 is painted red for a simple means of identification. The Model LO-205 has more inductance than the MP-205 to provide effective low frequency pick-up.

The electric field probe consists of a pick-up rod and is contained in an insulated handle-type probe.

A total of four line probes are available. Models LL-205 and LH-205 are designed for 50 and 500 ohms impedance respectively, and cover the frequency range of 20-1000 MC. The LL-205 is contained in the Standard Accessory Kit KT-205-D. Models LA-205 and LF-205 are also designed for 50 and 500 ohms impedance respectively. They cover the frequency range of 150 KC-30 MC and are part of Antenna Equipment LM-205. All models are housed in shields and are equipped with binding posts for easy attachment to the line to be evaluated. The probe is capacitively coupled to the line.

The remote indicator contains a meter duplicating that which is on the main instrument panel. An earphone jack is provided to facilitate aural monitoring.

The DC converters are of the rotary type and furnish 115 volts, 60 cycle power required for the operation of the equipment.

The headset is designed for 600 ohms impedance.

An injection block is provided for use with the broadband antenna.

A grounding strap serves to protect the operator from electrical shock during operation of the equipment.

SECTION II

Installation and Assembly

1. Selection of Site

When setting up the equipment for interference measurements, it should be so located that the appropriate antenna or probe can reach the interference source when connected through the 30 ft. length of R.F. cable. When using the equipment for field intensity measurements, a site must be chosen which is free from trees, electrical power and telephone lines, buildings and other projections that might interfere with the field strength pattern.

2. Assembly and Interconnections

Ascertain that the plug-in head covering the desired frequency range is inserted in the main unit. If not, loosen the head latch located near the left edge of the main panel. Holding back or locking the latch to clear the panel of the plug-in head, remove the head. Insert the head covering the desired frequency range, again holding the latch of the locking mechanism. Release the latch and tighten the locking screw. Place the unused heads in the transit chests to avoid any damage. Figure 2 illustrates the interconnection between components.

Remove from the accessory transit chest any additional components as may be required, including the following:

a. A.C. Line Cord. This cord leads from the POWER CONNECTOR located on the right side of the equipment panel to the 115 volts, 50 to 60 cycle power source.

b. R.F. Patch Cord - 6 Inches. Connect this cord between the ATTEN. OUTPUT connector near the left edge of the equipment panel and the connector on the plug-in head. If the head used has more than one frequency range, the cord must be attached to the connector corresponding to the frequency range desired.

c. Inverter. If the equipment is to be operated from a battery, the inverter corresponding to the available DC voltage (12 or 24 volts) is used. Connect the free end of the AC power cord to the outlet on the end of the inverter case.

d. DC Power Cord. By means of the DC power cord, connect the inverter to the battery. If the battery is part of a grounded system, connect the black lead of the DC power cord to the grounded terminal, regardless of battery polarity.

e. Remote Indicator. In certain instances it may be desirable to use the remote indicator in order to observe readings some distance from the location of the main unit.

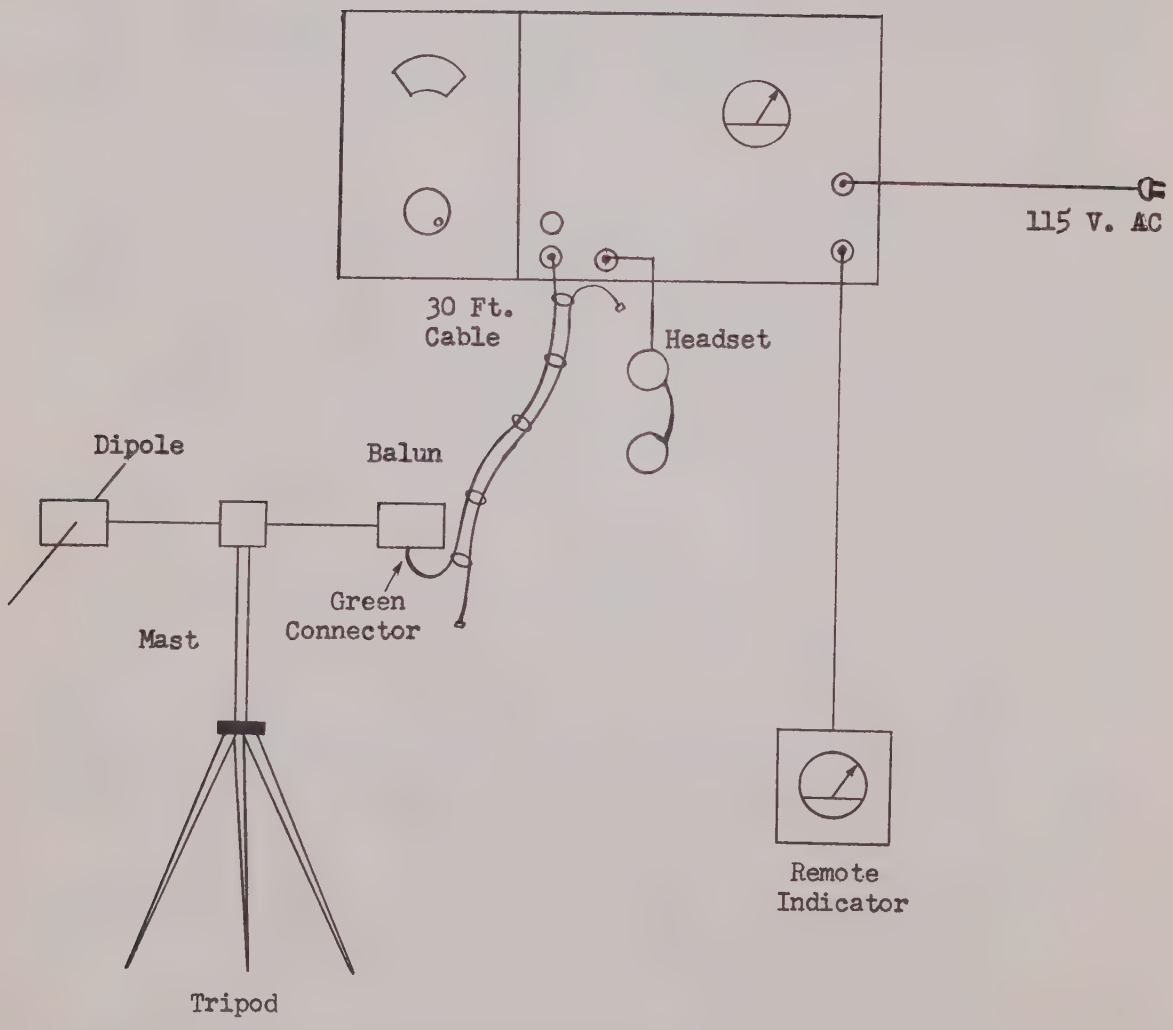


FIGURE 2

INTERCONNECTION
BETWEEN COMPONENTS

f. Remote Indicator Cable. When the remote indicator is to be used, it is connected to the main unit by this 25 ft. cable. The cable is connected to the receptacle marked RECORDER EXT. METER.

g. Headset. The headset is plugged into the PHONES jack located near the lower left-hand corner of the main equipment panel, or may be inserted into the jack on the remote indicator unit.

h. Grounding Strap. The plug end of the grounding strap is inserted in the jack marked GROUND located in the lower right-hand corner of the front panel. The other end of the cable may be connected to any suitable ground.

i. R. F. Cables. The two 30 ft. R.F. cables are taped together at fixed intervals in order to prevent shifting in their relative position. These cables must be used for all measurements since substitution of other cables of different types or having different lengths will disturb the measuring accuracy. When connecting the cables, the color coding must be observed. Attach one of the green plugs of the cable to the SIGNAL INPUT connector located in the lower left-hand corner of the main panel. The companion red cable is used only with the series method of calibration.

j. Injection Block. The injection block is used only in conjunction with the broadband antenna.

k. Magnetic Field Probes. In order to pick up the magnetic field component of R.F. interference (for relative readings only), the magnetic field probes are employed.

l. Electric Field Probe. The electric field probe is used to pick up the electric field component of R.F. interference. Attach to the 30 ft. cable with the green marking.

m. Line Probes. If conducted interference is to be measured, select either the 50 or 500 ohm line probe, depending on the frequency range and the impedance with which it is desired to load the line. Attach it to the 30 ft. R.F.cable with green markings. If an unbalanced circuit is to be measured, connect the side which is grounded or electrically closest to ground to the binding post marked by one dot. The "High" side is fed to the binding post marked by two dots. If a balanced circuit is to be evaluated, connect its center tap to the post marked by one dot. Ground this post if no center tap is available. Connect the two "High" sides to the two remaining binding posts. The unmarked binding post is connected merely to provide a balanced load for the line. Therefore, the connections to the two "High sides of the line must be reversed to obtain noise measurements for both sides of the balanced line.

n. Tripod. If an antenna is to be used, the tripod is employed as a supporting base. Attach the tripod crown to the legs and extend the legs to the desired height. Tighten the leg locking screws securely. The 3-section mast may be used with the dipole antenna.

o. Broadband Antenna. In order to operate the broadband antenna, its plane, cone and extension rods are required. Remove the rods on the tilt plate (near the center of the base) from their support clips, and insert them into the stud holes. This will permit angular adjustment of the antenna. Attach the antenna base to the tripod by securely fastening the screw located in the tripod crown to the corresponding hole in the tilt plate. By means of the three fasteners in the cone flange, attach the cone to the ground plane. The cone extension rods are inserted in the holes on top of the cone in order to obtain maximum operating efficiency of the antenna in the desired frequency range. After the antenna is completely assembled on the tripod, connect the injection block to the connector underneath the antenna base.

p. Dipole Antennas. There are three dipole antenna sets covering the frequency range from 20 MC to 1000 MC as follows:

20 - 200 MC (DM-205-T1)
200 - 400 MC (DM-205-T2)
400 - 1000 MC (DM-205-T3)

Each set consists of a bakelite tube having a dipole block on one end and a matching transformer on the other. On the 20-200 MC and the 200-400 MC sets, the dipole arms are separate and are attached to threaded inserts on opposite sides of the dipole block. There are two loose (unattached) pairs of adjustable dipole arms, one pair covering the frequency range from 20 to 140 MC, the other pair from 140 to 400 MC. Because of the physical size, the maximum extended length of the low frequency dipole arms is limited to 27 MC. For frequencies from 20 to 27 MC the dipole is extended to its maximum length. The chart on the following page allows for reduced effective height in this range. On the 400-1000 MC set the dipole arms are permanently attached to the block. To use any of the dipole antennas, attach the bakelite tube to the tripod mast by means of the clamp. Place the mast socket on the tripod crown and insert the mast into the socket. One or two additional mast sections may be used if desired. Tighten the centrally located screw on the tripod crown, thus locking the mast and base to the tripod. The dipole may be rotated about a horizontal axis by loosening the bakelite clamp thumbscrew. For rotation about a vertical axis, loosen the screw located under the mounting base of the tripod.

q. Megacycle Rules. The megacycle rules are used to extend the dipole arms to the proper length for the desired operating frequency. To cover the range from 20 to 400 MC, use the steel tape rule. For the range from 400 to 1000 MC, the engraved bakelite rule is employed. When using the steel tape, measure from the exact center of the dipole to the extreme tip of one dipole arm. Repeat the procedure for the other arm. When using the bakelite rule, measure from each edge of the plastic block which supports the dipole arms.

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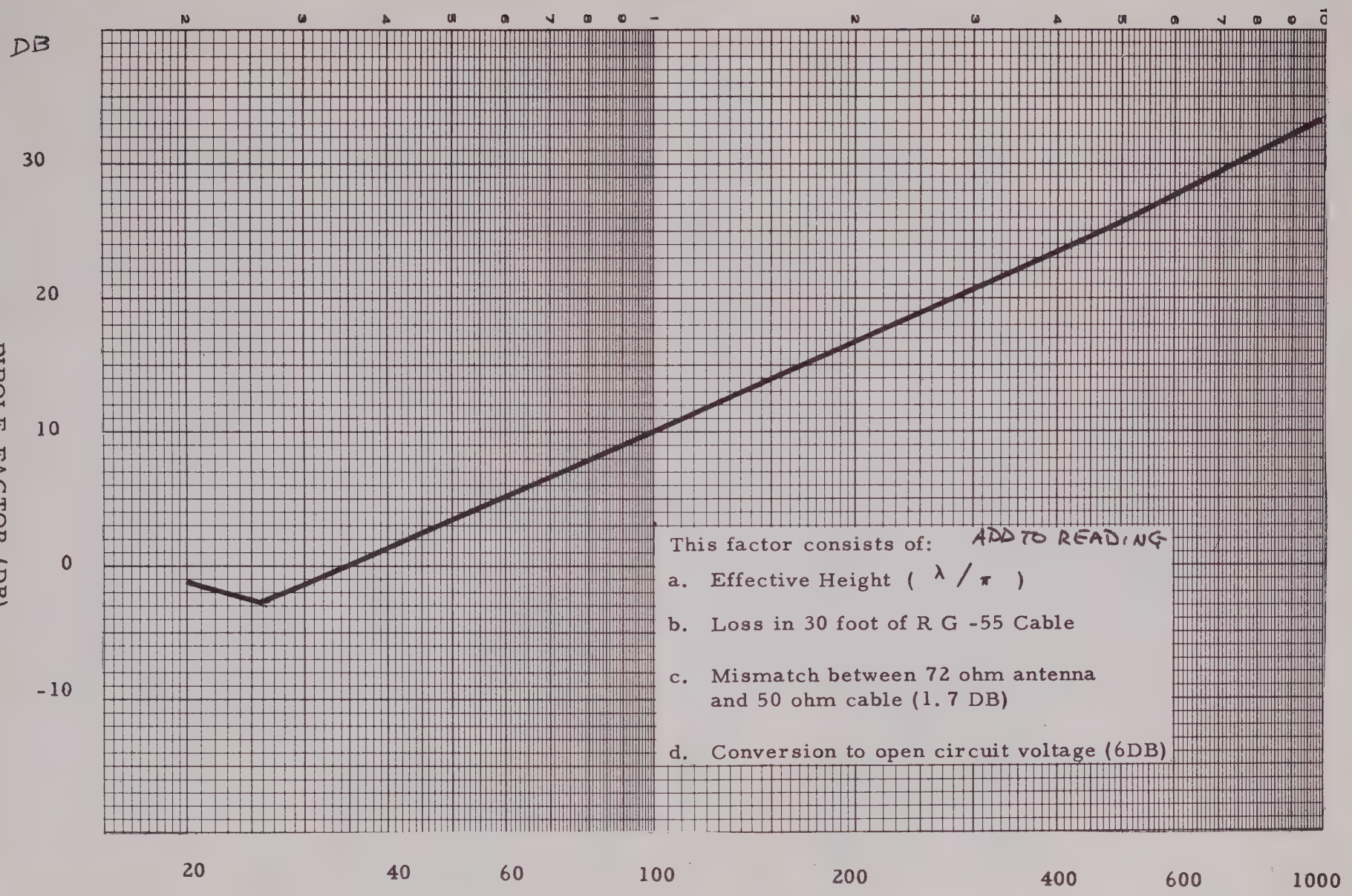


TABLE I

Applications and Methods of Measurement

Application (Units of Measurements)	Pick-up Device	Coupling Device	Calibration	Method of Measurement	Indication
Noise Measurement (Microvolts per Megacycle Bandwidth)	Broadband Antenna	Injection Block	Series	Direct Reading or Substitution	Meter or Slideback
	Vertical or Dipole	None	Shunt		
	Probes	None	Shunt		
Noise Field Intensity (Microvolts per Megacycle Bandwidth per meter	Dipole	None	Shunt	Direct Reading or Substitution	Meter or Slideback
	Vertical or Loop	None	Shunt		
R.F. Voltmeter (Carrier) (Microvolts)	Any	None	Shunt	Direct Reading	Meter
Carrier Field Intensity	Dipole	None	Shunt	Direct Reading	Meter
	Loop or Vertical	None	Shunt		

PART TWO - OPERATING INSTRUCTIONS

Section III

Operation

1. Introduction

Before outlining the detailed steps involved in the operation of this equipment, it is desirable at this point to explain briefly the various methods of measurement.

There are two basic measuring methods, the direct reading and the substitution method. To set up the instrument for direct reading noise measurement, a known signal from the internal impulse generator is fed to the receiver whose gain is adjusted to produce a specified indication on the meter. Unknown signals may then be read directly from the calibrated meter scale. Narrow band signals are read by means of this method only.

Using the substitution method, unknown broadband signals are measured by comparing them directly to the output of the internal impulse generator. The comparison may be visual, using the meter as an indicator, or aural, using the slideback method. By means of metered slideback, a visual indication of slideback measurements may be obtained.

2. Control Settings

Before attempting to operate this equipment, make certain that the controls are set to the positions indicated.

CONTROL	POSITION
FUNCTION SWITCH	ZERO ADJ.

NOTE: This switch selects the type of detector circuitry. After preliminary zero adjustment, all broadband measurements are made in the PULSE PEAK position. The CW AVERAGE and CW PEAK positions are used only for narrow band measurements.

IMPULSE GENERATOR	80 DB ABOVE 1 uv/MC

(For convenience the term DB above 1 uv/MC will be abbreviated to "DBMC" hereafter in this manual. Thus, 80 DB above 1 uv/MC will be written 80 DBMC.)

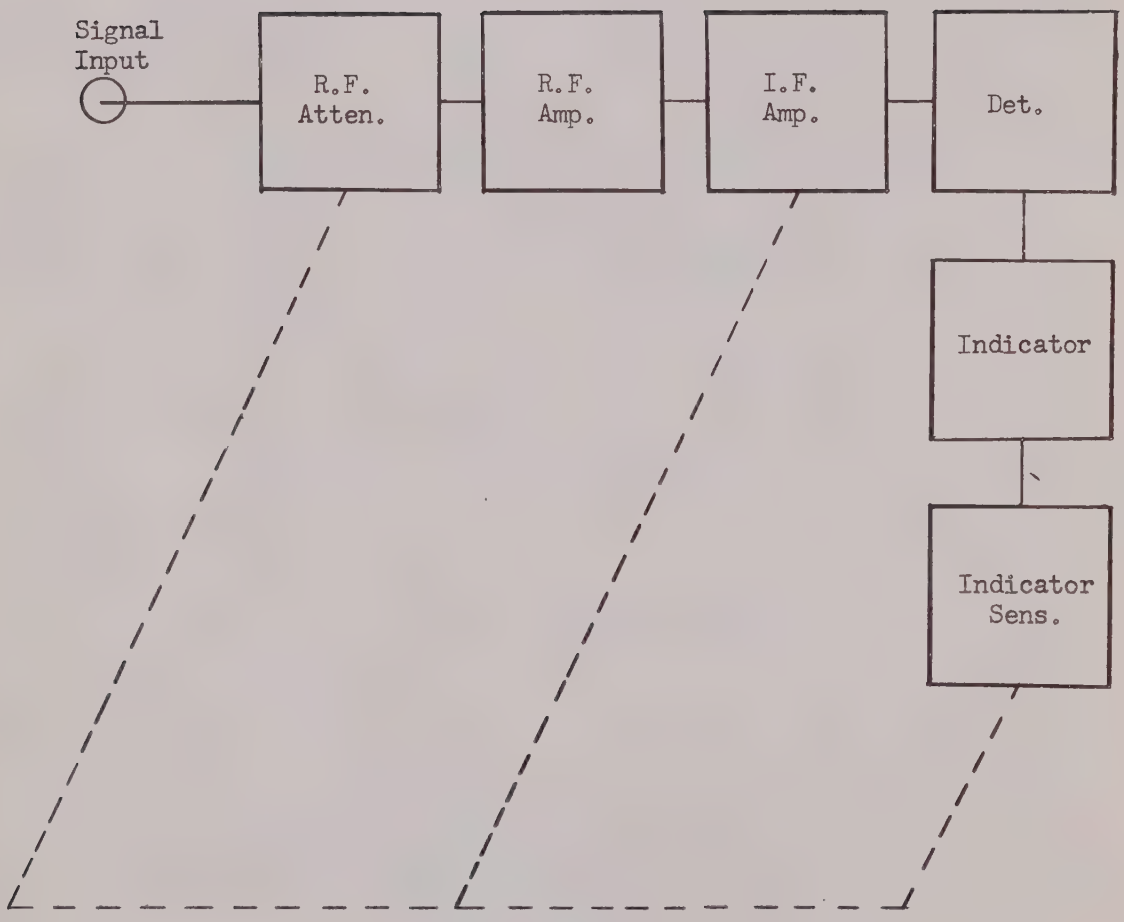


FIGURE 3
BLOCK DIAGRAM
SIGNAL ATTENUATOR

SIGNAL ATTENUATOR 20 DB

The SIGNAL ATTENUATOR inserts attenuation in R.F. and VTVM circuits (See Fig. 3 and Table II). A 50 ohm termination is provided in all positions except 0 SUBST. ONLY.

NOTE: The SIGNAL ATTENUATOR control knob must be pulled out to be turned. Turning without first pulling out may damage the attenuator. Upon lining up the dot on the control knob with the desired position, push the knob all the way in.

METER DAMP OFF

TABLE II

Signal Input Attenuator

Signal Input Attenuator Panel Marking	R.F. Attenuation DB	Meter Attenuation
80 DB	80	0
60 DB	60	0
40 DB	40	0
20 DB	20	0
0-cw. only	10	-10*
0-Subst. only	0	0

* Meter sensitivity increased by 10 DB.

IMPULSE GENERATOR OFF

VOLUME MAX. CW

POWER OFF

CALIBRATE SERIES

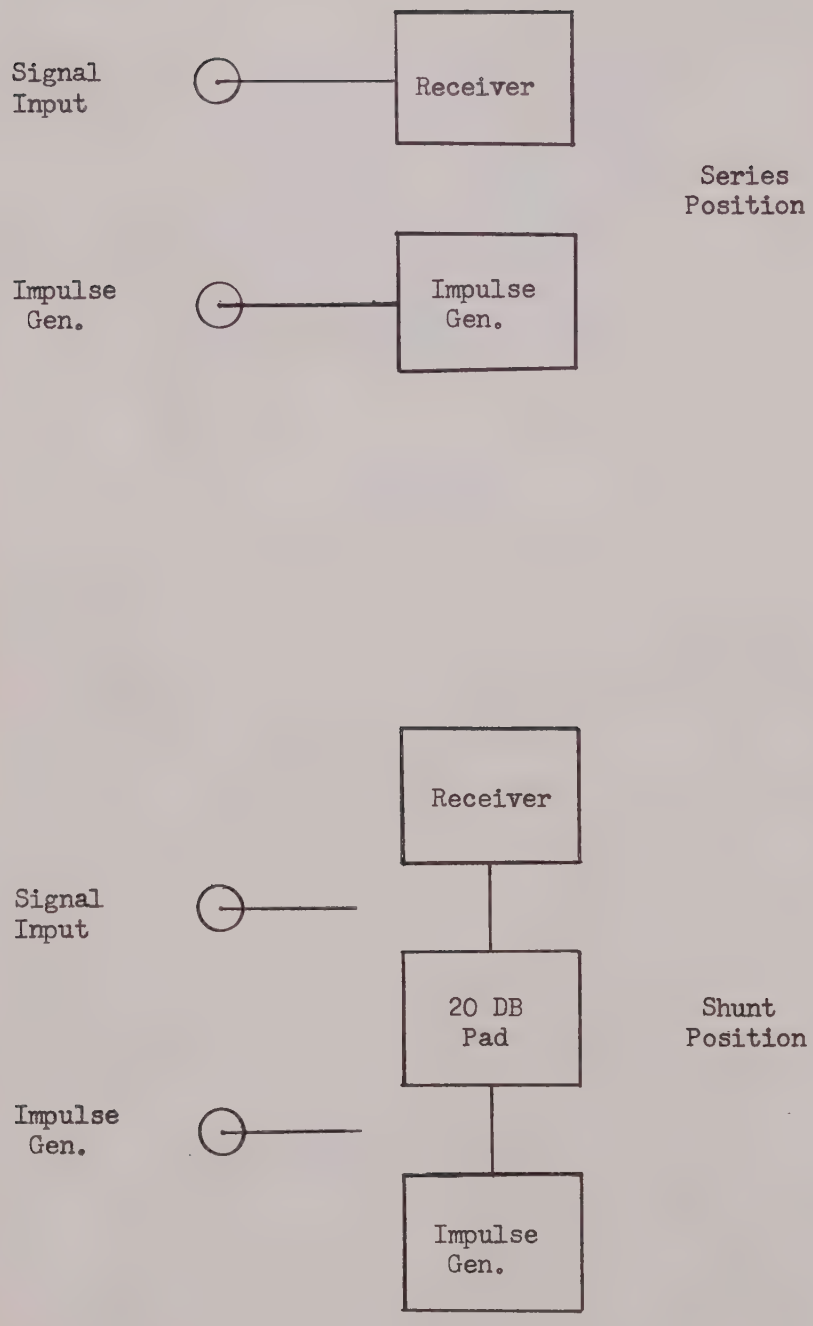


FIGURE 4
BLOCK DIAGRAM
CALIBRATE SWITCH

The calibrate switch controls two coaxial relays which change the connections to the SIGNAL INPUT and IMPULSE GEN. connectors as shown in Figure 4. In the SERIES position, the unknown signal is applied to the receiver input and in the SHUNT position the impulse generator output is applied to the receiver.

ZERO ADJ.	APPROX. CENTER
GAIN	MAX. CCW
SLIDE-BACK	MAX. CCW

3. Initial Adjustment

Turn POWER switch on. Allow a ten minute warm-up period before attempting to calibrate. Adjust the ZERO ADJ. control located above and to the right of the function switch, for a zero reading on the meter.

See PAGE 31 For 2 term. R

4. Broadband Measurements

4.1 Broadband Antenna-Direct Reading (20-1000 MC)

a. Connect the injection block to the broadband antenna.

b. Attach both of the 30 ft. cables to the correspondingly color coded receptacles on the injection block. The other ends of the cables are connected to the SIGNAL INPUT receptacle (green) and to the IMPULSE GEN. receptacle (red) on the main unit.

c. Turn IMPULSE GEN. switch to ON.

d. Set function switch to PULSE PEAK.

e. Set IMPULSE GENERATOR 70 DBMC and SIGNAL ATTENUATOR to 40 DB.

f. Set CAL. switch to the SERIES position.

g. Read the IMPULSE GENERATOR output directly on the meter.

h. Adjust the gain control for a meter reading of 10 DB.

i. Turn off IMPULSE GENERATOR. The instrument is now direct reading with a full scale of 80 DBMC. The range may be extended in either direction by means of the SIGNAL ATTENUATOR.

NOTE: This calibration procedure does not take into account variations in cable loss with frequency. This may be corrected by subtracting the cable loss factor shown in Figure 5, from the final reading.

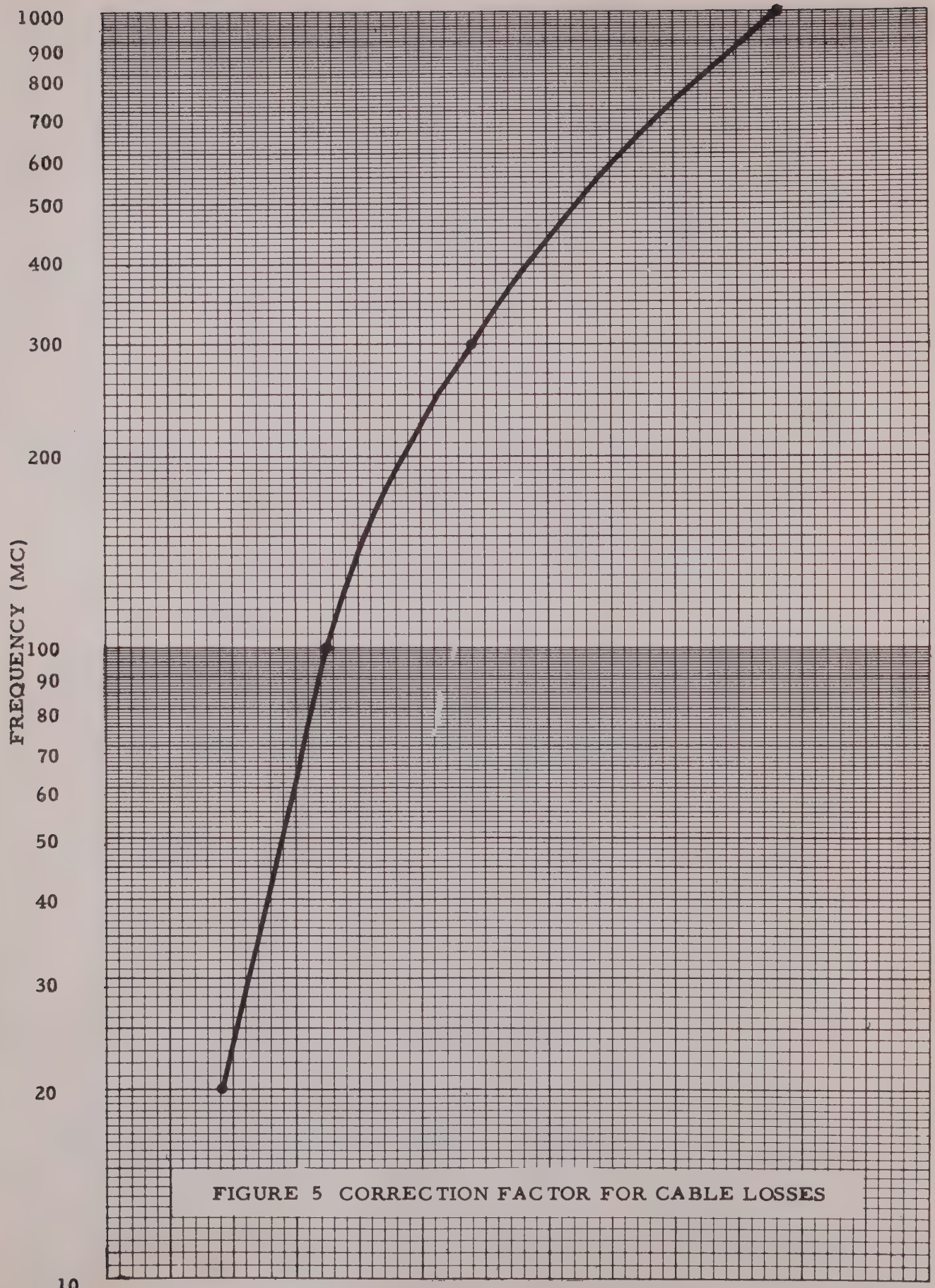


FIGURE 5 CORRECTION FACTOR FOR CABLE LOSSES

4.2 Broadband Antenna-Substitution Method

a. Connect the broadband antenna as in steps "a" and "b" of para. 4.1.

b. Set the function switch to PULSE PEAK and SIGNAL ATTENUATOR to 20 DB.

c. Set the IMPULSE GENERATOR switch to OFF and calibrate switch to SERIES.

d. Tune to the desired signal.

e. Adjust GAIN control for a convenient reference reading of the meter. If necessary, change the SIGNAL ATTENUATOR setting to avoid overload.

f. After the reference reading has been obtained, shut off the external noise source and turn on the IMPULSE GENERATOR switch. Do NOT move the gain control.

g. Adjust the IMPULSE GENERATOR controls to the same meter reading obtained in step "e" above. This is the level of the unknown signal.

h. Subtract the cable loss correction factor as shown in Figure 5.

4.3 Broadband Antenna - Slideback

In place of the visual method of substitution described above, the slideback method may be used. The slideback control applies a variable bias to the second detector. This produces a clipping action so that only signals exceeding the bias level are passed. As a result, the background noise is removed, leaving only the impulse noise peaks.

To use the slideback method, set the SLIDEBACK control at about 50% rotation and adjust the GAIN control until a signal is audible in the headphones.

a. Set the calibrate switch to SERIES, IMPULSE GENERATOR OFF and function switch to PULSE PEAK.

b. When the instrument is tuned to the desired frequency and the unknown signal is being received, set the SIGNAL ATTENUATOR to the highest setting that will still permit listening to the unknown noise.

c. Adjust the slideback control until the signal is at the point of disappearing.

d. Shut off the unknown signal. Do NOT move the SLIDEBACK or GAIN controls until the measurement is completed.

e. Turn on the IMPULSE GENERATOR and vary its output until it is just audible in the earphones.

f. Adjust the IMPULSE GENERATOR attenuator controls until the output is just at the point of disappearing as was the unknown signal. The setting of the IMPULSE GENERATOR dials indicates the level of the unknown signal in DBMC.

g. Subtract the cable loss correction factor as shown in Figure 5.

4.3.1 Metered Slideback

The metered slideback function provides a visual reference for slideback measurements.

a. Set the function switch to METERED SLIDEBACK and the SIGNAL ATTENUATOR to 20 DB.

b. Set the calibrate switch to SERIES and IMPULSE GENERATOR to 60 DBMC.

c. Adjust SLIDEBACK control for a 0 DB meter reading.

d. Turn the IMPULSE GENERATOR on and adjust GAIN for aural threshold as in paragraph 4.3. The instrument is now calibrated at 60 DBMC.

e. Shut off IMPULSE GENERATOR and turn on noise source.

f. Adjust the slideback control for threshold. Add to the meter reading, 60 DBMC to obtain the unknown level.

4.4 Vertical Antenna - Radiated Measurements

The 41" vertical antenna is used with Tuning Unit T-A/NF-205 to make radiated measurements. In order to make radiated measurements, set up the instrument as shown in the steps below.

a. Connect the antenna to the 30 ft., R.F. cable with the green connector.

b. Set the band switch on the tuning unit to the desired frequency range. Also set the band switch on the antenna to the same range.

c. Connect the attenuator output to the corresponding receptacle on the tuning unit by means of the 6" cable.

d. Turn the equipment on and after it has warmed up, adjust the ZERO ADJ. control for a zero reading on the meter.

4.4.1 Narrow Band Measurements

a. Set the function switch to CW PEAK and adjust the IMPULSE GENERATOR output controls to the value indicated in Figure 6 for the desired frequency.

b. Set the INPUT ATTENUATOR to 20 DB and turn IMPULSE GENERATOR switch ON.

c. Place CAL. switch in SHUNT position and adjust GAIN control for full scale indication on the meter.

d. Place the CAL. switch in SERIES position, and set the SIGNAL ATTENUATOR for maximum "on scale" meter reading.

e. Check by means of the tuning adjustment on the tuning unit that the desired signal produces maximum meter deflection. If in tuning to the signal to be measured an appreciable departure from the calibrating frequency was required, consult the calibration chart (Figure 6) and, if necessary, calibrate to the new frequency.

f. Add to the sum of the meter and SIGNAL ATTENUATOR readings (in DB), the antenna factor of Figure 7. The reading thus obtained in DB above one microvolt is the antenna induced voltage.

4.4.2 Substitution Method - Visual

To make a broadband measurement using the substitution mehtod, set up the instrument as shown in Paragraph 4.4, and complete the following steps:

a. Set the function switch to PULSE PEAK and CAL. switch to SERIES.

b. Adjust the tuning control on the tuning unit for maximum deflection of the meter (Max. Signal).

c. Adjust the SIGNAL ATTENUATOR and GAIN control for a convenient reference on the menter.

d. Set the CAL. switch to SHUNT, and turn the IMPULSE GENERATOR on.

e. Adjust the IMPULSE GENERATOR controls to obtain the same reference reading as in step "c" above.

f. Add to the impulse generator reading the antenna factor in Figure 7, 20 DB. This sum is the unknown level in DB above one microvolt per megacycle bandwidth.

4.4.3 Substitution Method - Slideback

a. Set the SLIDEBACK control at about 50% rotation and adjust the GAIN control until a signal is audible in the earphones.

b. Set the calibrate switch to SHUNT, IMPULSE GENERATOR to OFF and function switch to PULSE PEAK.

c. When the instrument is tuned to the desired frequency and the unknown signal is being received, set the SIGNAL ATTENUATOR to the highest setting that will still permit listening to the unknown noise.

d. Adjust the SLIDEBACK control until the signal is at the point of disappearing.

e. Shut off the unknown signal. Do NOT move the SLIDEBACK or GAIN controls until the measurement is completed.

f. Turn on the IMPULSE GENERATOR and vary its output until it is just audible in the earphones.

g. Adjust the IMPULSE GENERATOR attenuator controls until the output is just at the point of disappearing as was the unknown signal. The setting of the IMPULSE GENERATOR dials indicates the level of the unknown signal in DBMC.

h. Subtract the cable loss correction factor (Fig. 5).

4.4.4 Substitution Method - Metered Slideback

a. Set the function switch to METERED SLIDEBACK and the SIGNAL ATTENUATOR to 20 DB.

b. Set the calibrate switch to SHUNT and the IMPULSE GENERATOR to 60 DBMC.

c. Adjust the SLIDEBACK control for a 0 DB meter reading.

d. Turn the IMPULSE GENERATOR on and adjust the GAIN for aural threshold as in paragraph 4.4.3 above. The instrument is now calibrated at 60 DBMC.

e. Turn off the IMPULSE GENERATOR and turn the noise source on.

f. Adjust the SLIDEBACK control for threshold. Add 60 DBMC to the meter reading to obtain the unknown level.

4.5 Probes

a. Connect the desired probe to the 30 ft. R.F. Cable with the green connector.

b. For maximum sensitivity, set the SIGNAL ATTENUATOR to 0 SUBST. ONLY.

c. Turn the function switch to PULSE PEAK and the calibrate switch to SERIES.

d. Adjust the GAIN control until the meter reads approximately 0 DB in the absence of any signal.

e. Place the probe in the field of the unknown noise. If the meter reads off scale, increase the setting of the SIGNAL ATTENUATOR for a suitable reference reading.

f. Set calibrate switch to SHUNT and turn IMPULSE GENERATOR switch on.

g. Adjust the IMPULSE GENERATOR control until meter reads at the chosen reference. The reading of the IMPULSE GENERATOR output attenuator gives the unknown voltage in DBMC at the SIGNAL INPUT receptacle. In order for this result to be of value, it is necessary that the probe be placed in a specified location in relation to the equipment to be measured.

h. Probe measurements are frequently concerned with relative changes produced by application of noise suppression measures. To evaluate these changes, set the calibrate switch to SERIES, and the GAIN control to a convenient reference point such as 10 DB. Then, any changes in the noise producing source may be observed directly and the amount of change evaluated accurately in DB.

4.6 Noise Field Intensity - Dipole (Direct Reading)

a. Select the appropriate antenna assembly and connect it to the 30 ft. R.F. cable with the green connector.

b. Adjust the arms to the proper length for the frequency of the signal to be measured using the appropriate megacycle ruler.

c. Set function switch to PULSE PEAK and SIGNAL ATTENUATOR to 40 DB.

d. Set calibrate switch to SHUNT and IMPULSE GENERATOR to 70 DBMC.

e. Turn the IMPULSE GENERATOR on and adjust GAIN control until meter reads 10 DB. This is equivalent to 70 DBMC. The instrument is now calibrated for 80 DBMC full scale.

f. Set calibrate switch to SERIES. The instrument is now ready for use.

g. Turn the antenna first about a vertical axis, then about a horizontal axis, until maximum indication of the meter is obtained. After determining the optimum dipole direction, extend the mast to the desired height.

h. Adjust the SIGNAL ATTENUATOR for an on-scale reading and note reading.

i. To obtain the field strength at the antenna, add the dipole antenna factor (page 13). The result is the field strength of the unknown signal in DBMC per meter.

Antenna Factors for Dipoles DM-205

Frequency	DB
20 MC	8.4
68 MC	9.0
132 MC	9.5
220 MC	10.0
330 MC	10.5
462 MC	11.0
620 MC	11.5
790 MC	12.0
940 MC	12.5
1000 MC	12.8

This chart includes:- Conversion to open circuit voltage (6 DB)

Mismatch, 72 ohm antenna to 50 ohm cable (1.7 DB)

Transmission line loss vs frequency

Figure 8

4.7 Noise Field Intensity - Dipole (Substitution)

a. Complete steps "a" and "b" of paragraph 4.6.

b. Set function switch to PULSE PEAK, SIGNAL ATTENUATOR to 0 DB and calibrate switch to SERIES.

c. Tune to the desired signal and adjust dipole antenna direction and height as in step "g" of paragraph 4.6.

d. Adjust the GAIN control for a suitable reference on the meter.

NOTE: The SIGNAL ATTENUATOR should be set to the highest setting consistent with good signal to noise ratio.

e. Set calibrate switch to SHUNT and turn the IMPULSE GENERATOR on.

f. Adjust IMPULSE GENERATOR controls for the same meter reference as was obtained in step "d". The IMPULSE GENERATOR reading is the level of the unknown signal at the SIGNAL INPUT receptacle.

g. To obtain the field strength, add the dipole antenna factor (page 13) as in step "i" of paragraph 4.6.

This measurement may also be performed using slideback as a means of comparison in place of visual indication.

4.8 Noise Field Intensity - Vertical or Loop Antennas

Field strength measurements may be conducted by means of either the loop or the vertical antenna. Results obtained when using the loop antenna will be more accurate since they are independent of ground conditions and height above ground. On the other hand, a disadvantage of the loop antenna, especially at the lower frequencies, is its small effective height compared to that of the vertical antenna. For these reasons, the loop antenna should be used for field strength measurements when the signal level is sufficient to produce an adequate indication. Since the loop antenna is a directive device, it must be rotated for maximum pickup as indicated by the meter.

If a low signal level makes use of the vertical antenna necessary, it is recommended that the antenna be located over the center of a network of wires placed on the ground and covering an area of approximately 800 square feet. The base of the antenna coupler must be connected to the ground network by a wide bonding strap.

In spite of the precaution of spreading a ground wire network, it is recommended that for greater accuracy, the vertical antenna be calibrated by means of the loop antenna at or near the frequency to be measured.

ANTENNA "FACTOR" FOR

LOOP ANTENNA LP - 205

FREQUENCY	DB	FREQUENCY	DB
150 KC	41.0	2.4 MC	27.8
175 KC	40.0	2.7 MC	27.3
200 KC	39.5	3.0 MC	27.0
225 KC	38.8	3,4 MC	26.6
250 KC	38.3	3.7 MC	26.1
275 KC	37.8	4.0 MC	25.9
300 KC	37.3	4.4 MC	25.5
325 KC	36.9	4.7 MC	25.3
360 KC	36.5	5.2 MC	25.1
400 KC	36.5	6.0 MC	24.0
450 KC	36.0	7.0 MC	23.0
500 KC	35.5	8.0 MC	22.0
560 KC	35.0	9.0 MC	21.2
620 KC	34.4	10.0 MC	20.8
700 KC	34.0	11.0 MC	20.3
760 KC	33.5	12.0 MC	20.0
820 KC	33.0		
870 KC	32.8	12.7 MC	19.8
		15.0 MC	19.3
900 KC	32.5	19.0 MC	19.0
1000 KC	31.8	21.0 MC	18.6
1.1 MC	31.0	24.0 MC	18.4
1.3 MC	30.2	27.0 MC	18.2
1.5 MC	29.8	30.0 MC	18.0
1.7 MC	29.3		
1.9 MC	29.2		
2.1 MC	29.0		

FOR SUBSTITUTION MEASUREMENTS ADD 20 DB TO THE ABOVE FACTORS

REVISED DATE
JANUARY 6, 1964

FIGURE 9

The calibration procedure is the same as that described in paragraphs 4.4, 4.4.1, 4.4.2 and 4.4.3. In order to obtain field strength in DB above one microvolt per meter, refer to Figure 7 for the vertical antenna and Figure 9 for the loop. Add 6 DB (the effective height of a 41" rod) to the readings obtained using Figure 7.

5. Two-Terminal R.F. Voltmeter (Narrow Band)

To use the instrument as a two-terminal R.F. Voltmeter, proceed as shown in the steps below.

a. Set the SIGNAL ATTENUATOR to 20 DB (O-CW only position for T-A/NF-205 and T-3/NF-205). At 20 DB, this results in a full scale sensitivity of 100 microvolts for Tuning Units T-A/NF-205, T-1/NF-205 and T-2/NF-205 and 1000 microvolts full scale for T-3/NF-205. This results in the following full scale sensitivities.

Full Scale Sensitivity (uv)

Attenuator Setting	T-A/NF-205, T-1/NF-205 T-2/NF-205	T-3/NF-205
O-CW only	10 uv	100 uv
20 DB	100 uv	1000 uv
40 DB	1000 uv	10,000 uv
60 DB	10,000 uv	100,000 uv
80 DB	100,000 uv	1 volt

b. Using the calibration charts (Figures 6 and 10 to 12), determine the required impulse level for the desired frequency.

c. Turn the IMPULSE GENERATOR on, and set the IMPULSE GENERATOR controls to the value obtained from the chart. If the value shown on the chart ends in .5 (i.e. 60.5, 58.5, etc.,), set the IMPULSE GENERATOR controls to the whole number (60, 58, etc.), and using the GAIN control set the meter for $\frac{1}{2}$ DB less than full scale.

d. Set the function switch to CW PEAK and the CAL. switch to SHUNT.

e. Adjust the GAIN control to obtain a full scale meter reading.

f. Turn the function switch to CW AVERAGE and set the CAL. switch to SERIES. The instrument is now calibrated to read 100 (or if Tuning Unit T-3 is used, 1000) microvolts full scale. By changing the SIGNAL ATTENUATOR setting, the sensitivity may be increased to

BANDWIDTH DATA AND CALIBRATION CHART FOR
TUNING UNIT, T-1/NF-205

SERIAL NO.

FREQ. MC	BANDWIDTH IN MC	BANDWIDTH FACTOR IN DB	IMPULSE GEN. LEVEL IN DB ABOVE 1 uv/MC
20			
30			
40			
50			
60			
65			
62			
80			
100			
120			
140			
160			
180			
200			

FIGURE 10

BANDWIDTH DATA AND CALIBRATION CHART FOR
TUNING UNIT, T-1/NF-205

SERIAL NO. U-14063

FREQ. MC	BANDWIDTH IN MC	BANDWIDTH FACTOR IN DB	IMPULSE GEN. LEVEL IN DB ABOVE 1 uv/MC
20			57.5
30			56.5
40			56.5
50			56.5
60			56.5
65			57.0
62			58.0
80			57.5
100			57.5
120			58.0
140			57.5
160			58.5
180			59.0
200			59.5

FIGURE 10

BANDWIDTH DATA AND CALIBRATION CHART FOR
TUNING UNIT, T-2/NF-205

SERIAL NO. U-13415

FREQ. MC	BANDWIDTH IN MC	BANDWIDTH FACTOR IN DB	IMPULSE GEN. LEVEL IN DB ABOVE 1 uv/MC
190			51.0
200			51.5
210			51.0
220			51.0
240			51.0
260			51.0
280			50.5
300			50.5
320			51.0
340			51.0
360			51.0
380			51.0
400			51.5

FIGURE 11

CALIBRATION CHART FOR TUNING UNIT T-3/NF-205

SERIAL NO. U-14095

12-3069

FREQUENCY IN MC	IMPULSE GEN. LEVEL IN DB ABOVE 1 uv/MC
400	46.5
425	47.0
450	47.5
475	47.5
500	47.5
525	47.5
550	47.5
575	47.5
600	47.5
625	47.5
650	47.5
675	47.5
700	47.5
700	47.5
725	47.5
750	47.5
775	47.5
800	47.5
825	47.0
850	46.5
875	46.5
900	45.5
925	44.5
950	43.5
975	43.5
1000	43.5

FIGURE 12

10 (or if Tuning Unit T-3 is used, 100) microvolts full scale, or it may be decreased in steps to 100,000 microvolts.

NOTE: When changing to a different frequency, repeat the calibration procedure described above.

6. Carrier Field Intensity Measurements (Dipole)

To make carrier field intensity measurements in the frequency range of 20-1000 MC (using a dipole antenna), calibrate the instrument as a two-terminal R.F. voltmeter as outlined in paragraph 5 above, and complete the following steps:

a. Connect the appropriate dipole antenna through the 30 ft. R.F. cable to the SIGNAL INPUT receptacle.

b. Tune to the desired signal and adjust the dipole as described in step "h" of paragraph 4.6.

c. Set the SIGNAL ATTENUATOR so that an on scale reading is obtained.

NOTE: The O-SUBST. ONLY position of the SIGNAL ATTENUATOR may not be used since it does not provide a proper termination to the balun.

d. Note the meter reading in DB above one microvolt taking into account the SIGNAL ATTENUATOR setting (20 DB above 1 uv full scale for O-CW ONLY).

e. From the dipole antenna factor chart, determine the factor for the frequency used. Add this to the reading obtained in step "d" above. The result is the field strength in DB above 1 uv/meter. In the presence of high ambient interference or high hiss level of the equipment, an accurate carrier may be performed in the following manner:

Note the reading in microvolts produced by the combined noise and carrier levels. Detune the equipment sufficiently to lose the carrier signal. Note the reading produced by the noise level alone. Apply the formula:

$$S = \sqrt{A^2 - N^2}$$

in which S is the unknown carrier level, A is the combined noise and carrier level, and N is the noise level alone.

6.1 Carrier Field Intensity - Vertical or Loop Antenna

To make carrier field intensity measurements in the frequency range of 150 KC - 30 MC, follow the procedure shown below.

a. Set the band switch on the tuning unit to the appropriate range, and

set the corresponding antenna switch to the same range.

b. Tune to the approximate frequency of the unknown signal.

c. Set the SIGNAL ATTENUATOR to 20 DB.

d. Set the function switch to CW PEAK and turn the IMPULSE GENERATOR on.

e. Set CAL. switch to SHUNT.

f. From the calibration chart, Figure 6, determine the required impulse level and set the IMPULSE GENERATOR controls to this value.

g. Adjust the GAIN control for a full scale reading. Shut off the IMPULSE GENERATOR and set the function switch to CW AVERAGE.

h. Set CAL. switch to SERIES. The instrument is now direct reading in terms of microvolts at the input terminals.

i. Set the SIGNAL ATTENUATOR for an on scale reading.

j. Adjust the TUNING control for maximum meter indication from the unknown signal. If the loop is used, rotate for maximum. The meter reading obtained, added to the SIGNAL ATTENUATOR setting, gives the level of the unknown signal in DB above 1 microvolt at the input terminals. To obtain field strength in DB above 1 uv/meter, add the antenna factor from Figure 7 plus a constant of 6 DB (effective height of the vertical antenna) for the vertical. For the loop antenna measurement, add factor shown in Figure 9.

PART THREE - REPAIR INSTRUCTIONS

Section IV

Theory of Operation

1. Signal Pickup Devices

1.1 Dipole Antennas

Field strength measurements above 20 MC are made with half wave dipoles. Due to end effects, the electrical length is somewhat less than half a wavelength. This correction is automatically provided by the megacycle rulers.

The balanced output from the center of the antenna is fed through a pair of coaxial cables to a balun, the input side of which is balanced. The balun transforms the picked up voltage to an unbalanced output which is fed to the instrument through a 30 ft. R.F. cable. The cables between the antenna and balun are at right angles to the antenna so that they do not disturb the field. In addition, the balun is removed from the antenna by the length of the boom in order to keep the 30 ft. R.F. cable out of the immediate dipole field. The entire dipole assembly is mounted on a 3-section mast and may be elevated to minimize ground effects. Figure 13 shows (a) a schematic diagram of cable connections to the balun, and (b) a simplified schematic indicating that the actual coupling device consists of two one-turn loops coupled together.

1.2 Vertical Antenna

The vertical antenna is designed for operation with Tuning Unit T-A/NF-205. This covers the frequency range of 150 KC to 30 MC. Over this frequency range, the impedance of the antenna is high and varies with frequency. To match the output of the antenna to the 50 ohm R.F. cable, a series of matching transformers are provided, one for each frequency band. These transformers are contained in the antenna coupler and are selected by a six-position switch having the same positions as the band switch on T-A/NF-205.

1.3 Loop Antenna

The loop antenna, also designed for use with Tuning Unit T-A/NF-205, is not as sensitive as the vertical but has the advantage of directivity. The loop also responds to magnetic fields whereas the vertical responds only to electrical fields. Since the loop has a very low impedance, matching transformers are provided in the base to match the antenna to the 50 ohm line. A band switch similar to that used on the vertical antenna coupler is also provided.

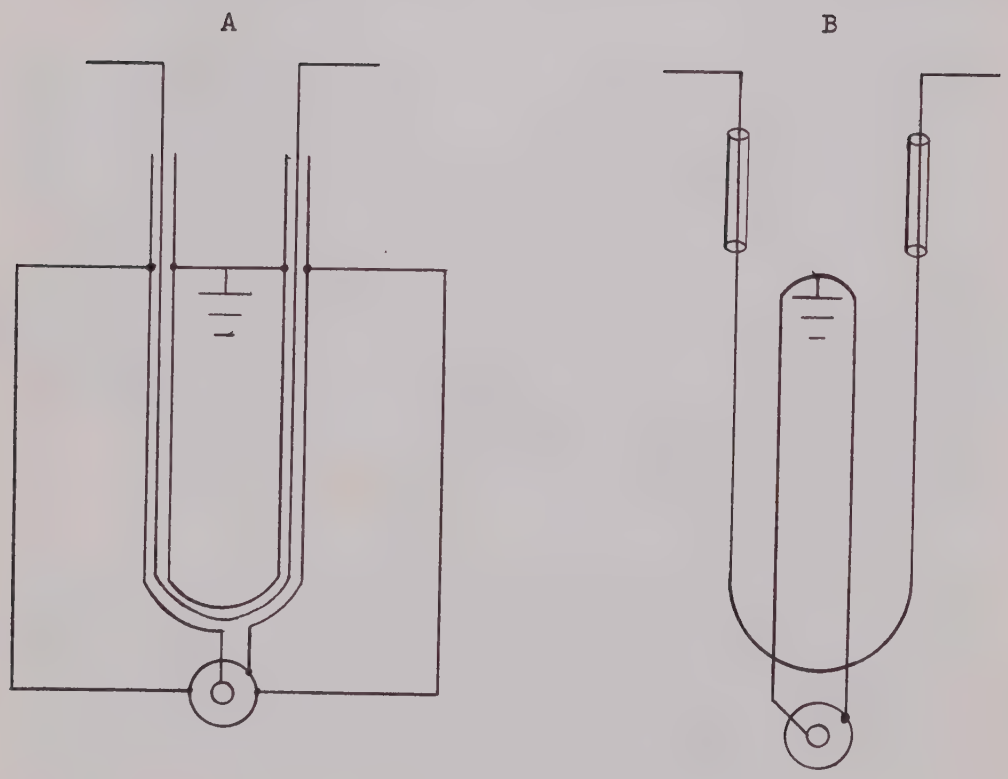


FIGURE 13

BALUN

1.4 Broadband Antenna

The Broadband Antenna consists of a cone equipped with fittings for extension rods, 6 rods and a ground plane. The cone and plane assembly provides an antenna system that requires no tuning. This antenna must be used with the injection block.

2. Injection Block

The purpose of the injection block is to permit the calibrating signal to be inserted in series with the antenna circuit. An L-type attenuator was chosen so that the calibrating voltage may be injected across 5 ohms. This resistance is small compared to any likely antenna circuit impedance so that open circuit antenna voltage may be measured accurately.

3. Impulse Generator

The impulse generator has a pulse repetition rate corresponding to the power line frequency (50 to 60 cycles per second). The pulses are obtained by discharging a coaxial line through a pair of contacts into a load impedance. The output impedance is 50 ohms and the maximum output level is 100,000 microvolts per megacycle bandwidth. This output is adjustable over an 80 DB range in 1 DB steps by means of two step attenuators.

4. Signal Attenuator

The instrument utilizes a step attenuator in the signal input circuit. In view of the high frequencies involved, this attenuator uses coaxial networks, so designed that the resulting VSWR is kept to a low value. Each attenuator section is a resistive "T" pad in which the series elements are rod resistors and the shunt element is a disc resistor. The diameter of the outer conductor is so calculated that with the rod resistors acting as inner conductors, a perfect 50 ohm line results at the beginning and the end of each network.

In the 0-SUBST. ONLY position, the instrument operates at full sensitivity. In the 0 CW ONLY position, 10 DB of RF attenuation is inserted. At the same time, the VTVM sensitivity is increased by 10 DB. In the 20, 40, 60 and 80 DB positions, those amounts of RF attenuation are inserted respectively.

5. Tuning Unit T-A/NF-205

Tuning Unit T-A/NF-205 covers the frequency range of 150 KC to 30 MC. The frequency range is divided into six turret switched bands using IF frequencies of 455 KC and 1.6 MC. The proper IF frequency is chosen automatically by the band switching turret.

Band	Frequency	IF
1	150 KC - 360 KC	455 KC
2	360 KC - 870 KC	1.6 MC
3	870 KC - 2.1 MC	455 KC
4	2.1 MC - 5.2 MC	1.6 MC
5	5.2 MC - 12.5 MC	1.6 MC
6	12.5 MC - 30 MC	1.6 MC

The input signal, after passing through the signal attenuator in the basic measuring unit, is applied to a tuned circuit preceding an RF amplifier. This RF amplifier is a type 5702 pentode. The signal is then fed to the tuned mixer stage employing a 5875 tube where it is mixed with the local oscillator signal. The local oscillator uses a 5702 type tube and operates above the signal frequency by an amount equal to the IF frequency. The resulting IF signal is amplified by the corresponding IF amplifier. Each IF amplifier consists of 4 double tuned stages using 6BJ6 tubes.

6. Tuning Unit T-1/NF-205

Tuning Unit T-1/NF-205 covers the frequency range from 20 MC to 200 MC in two bands. Each band contains an RF section. One covers the frequency range from 20-65 MC, the other from 65-200 MC.

Each RF section uses a four-section "inductuner" as its variable tuning element. Each section of the inductuner consists of a continuously variable inductor, which in conjunction with the proper capacitor, end conductor and in some instances, shunt inductor, covers the desired frequency range.

From the input, the signal is fed through the first tuned circuit to the grid of the first RF amplifier (6AK5). The plate of this stage is fed directly into the second tuned circuit, which in turn is capacitively coupled into the grid circuit of the second RF amplifier (6AK5). The signal obtained in the plate circuit of this stage is applied to the third tuned circuit, which is coupled to the grid of the mixer stage ($\frac{1}{2}$ of a 12AT7 in the 20-65 MC range, $\frac{1}{2}$ of a 6U8 in the 65-200 MC range). The other section of the mixer tube serves as the local oscillator. Since the IF frequency of the unit is 10.7 MC, the oscillator generates a frequency which is 10.7 MC higher than the corresponding RF frequency. The resultant frequency difference of 10.7 MC is applied from the plate of the mixer to the IF line transformer.

Change-over of the two frequency ranges is accomplished by means of a band selector switch which switches the following functions:

"B" supply voltage

Frequency Dial Illumination

IF output

Gain

The 10.7 MC IF amplifier consists of three amplifying stages and a cathode follower output stage. The output signal of the RF section is switched into a low impedance line which feeds into the low impedance side of a line transformer. The high impedance circuit of this transformer is fed into the grid circuit of the first IF amplifier stage (6AK5). Its output is applied, through a double tuned IF transformer, to the grid of the second IF amplifier (6BJ6). This stage is similarly coupled to the third IF amplifier (6BJ6). The output of the third IF amplifier is fed through a single tuned IF output transformer to the grid of a triode connected 6BJ6 which is used as a cathode follower.

7. Tuning Unit T-2/NF-205

Tuning Unit T-2/NF-205 covers the frequency range from 200 to 400 MC in one continuously tunable band.

The RF amplifier consists of a grounded grid RF amplifier stage, a local oscillator, and a crystal mixer. The input signal is fed to the first tuned circuit, then into the cathode of a type 5876 grounded grid RF amplifier. The variable tuning elements used in this tuner are three individual tuning capacitors ganged together by means of a worm drive shaft. The plate circuit of the RF amplifier stage is tuned and inductively coupled to an untuned pickup coil which feeds the signal to the 1N21B crystal mixer. The local oscillator operates at a frequency 30 MC higher than the corresponding RF frequency. Its energy is fed inductively into the crystal pickup coil. In the mixer, it is combined with the RF signal producing a difference in frequency of 30 MC which is the IF frequency.

The 30 MC IF amplifier consists of 4 amplifier stages and one cathode follower output stage. Its theory of operation follows closely with that of the 10.7 IF amplifier described in paragraph 6, therefore, it will not be discussed further here.

8. Tuning Unit T-3/NF-205

The frequency range of 400-1000 MC is divided into two bands; 400-700 MC and 700-1000 MC. The circuitry used in the two ranges is essentially identical escept that the constants are adjusted to correspond to the proper frequencies.

The tuned circuits used are capacity loaded quarter-wave lines in the RF circuits and capacity loaded half-wave lines in the oscillator circuit. Frequency tuning is accomplished by varying the amount of capacity loading of the lines.

The input signal is applied to a coupled pair of tuned circuits preceding a grounded grid triode, type 5876. The plate of the 5876 is tuned by means of a single tuned circuit which is inductively coupled to a type 1N21B crystal. The local oscillator is also inductively coupled to this crystal mixer. In the 400-700 MC range, a 6T4 is used as the local oscillator, whereas in the 700-1000 MC range a 6F4 tube is used. The local oscillator operates at 42 MC above the fundamental frequency, therefore, the mixer output produces an IF frequency of 42 MC.

The frequency range switch applies the mixer output of either the 400-700 MC or the 700-1000 MC tuner to the input of the IF amplifier. At the same time, it switches the "B" voltage and dial lights. The first stage of the IF amplifier uses a cascode circuit in order to provide a low noise figure. A 6BQ7A double triode is employed in this stage. It is followed by four stages of synchronously tuned pentodes, type 6AK5 and a 6BJ6 in a cathode follower circuit.

9. Metering and Output Circuits

Outputs from the detector assembly are connected to the meter and audio circuitry as indicated in Figure 14. In all positions of the function switch except METERED SLIDEBACK, the indicating meter is connected between the cathodes of V-24, type 12AU7. With the function switch in ZERO ADJ. position, the bias voltage supply to the gain control system is increased by a factor of about ten. This serves to cut off the IF amplifier, thus permitting a meter zero adjustment by means of the ZERO ADJ. control.

Slideback bias is applied only in the PULSE PEAK and METERED SLIDEBACK positions of the function switch. METERED SLIDEBACK is a function in which the meter is used to measure the slideback bias.

The METER DAMP switch connects an RC network across the meter to provide electrical damping. This is sometime helpful when intermittent transients disturb readings.

The audio detector is followed by a two-stage audio amplifier. Its output is fed through a transformer and an RF filter network to the phone jacks on the front panel.

10. Power Supply

The power supply furnishes +150 volts, -150 volts, 450 volts charging voltage for the impulse generator, 1.25 volts for the electrometer filaments, and 6.3 volts AC. These voltages are regulated to make them independent of changes in either the primary supply voltage or in current drain in the various circuits due to changes in functional requirements.

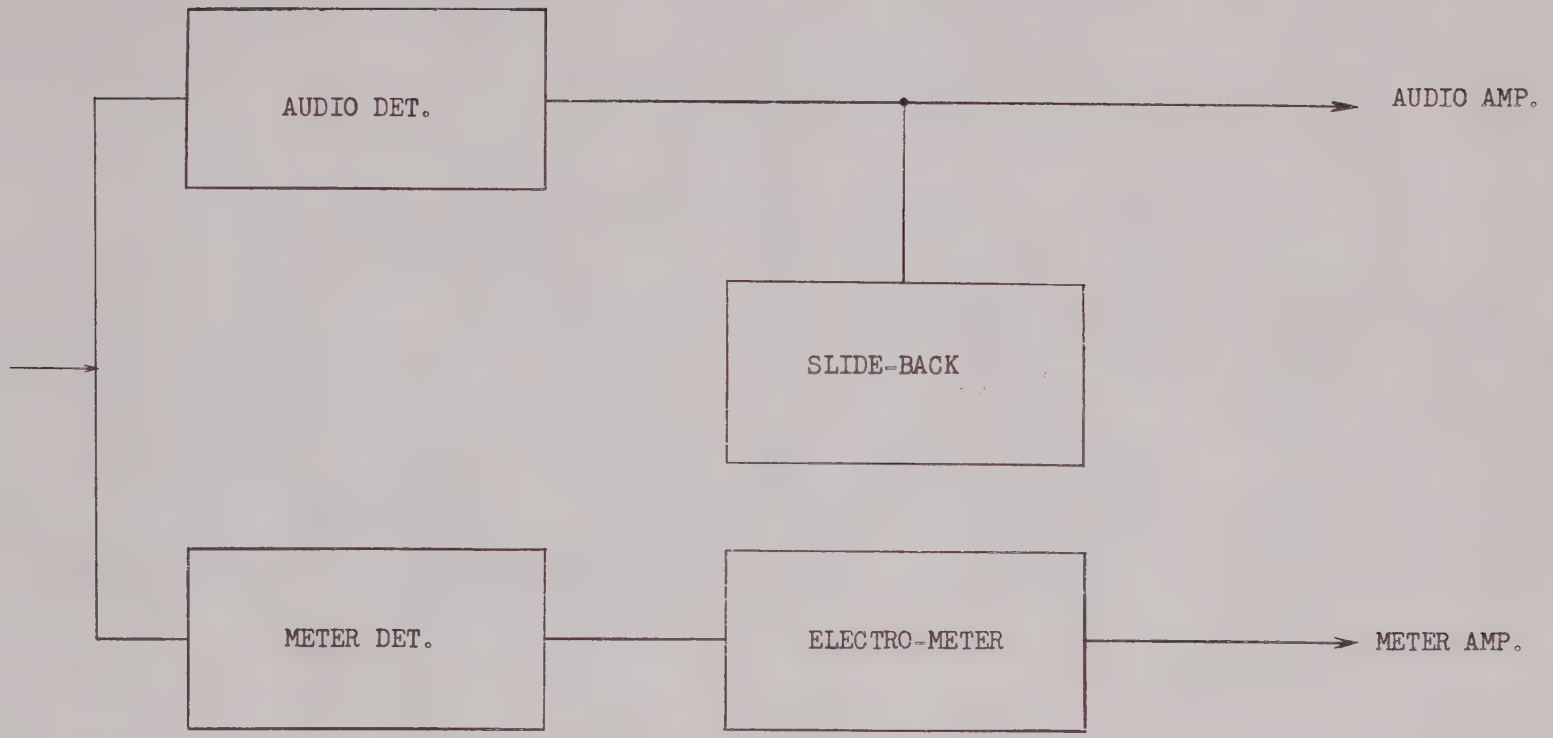


FIGURE 14
BLOCK DIAGRAM
DETECTOR ASSEMBLY

Section V

Alignment Procedures

1. Tuning Unit T-A/NF-205

Remove the dust covers from the tuning unit and basic measuring unit and the back plate from the detector assembly. Plug the tuning unit in and turn the power on. Before attempting to make any of the following adjustments, the equipment should be permitted to warm up for a period of not less than 15 minutes.

1.1 IF Amplifier, 455 KC

Set the function switch to the CW AVERAGE position, and the band switch on the tuning unit to .15 - .36 MC range. The SIGNAL ATTENUATOR must be kept in the 20 DB position for all the following alignment procedures, unless otherwise specified. Feed a 455 KC signal from an external signal generator thru a .001 capacitor to the 455 KC IF input connector. Keep the signal generator and the GAIN control so adjusted that no overload occurs. Peak transformers T704, T705, T706 and T707. Gradually decrease the output of the signal generator to prevent overloading while tuning the transformers for maximum output.

1.2 IF Amplifier, 1600 KC

Set the function switch to the CW AVERAGE position, and the band switch on the tuning unit to the .36 - .87 MC range. The SIGNAL ATTENUATOR must be kept in the 20 DB position for all of the following alignment procedures unless otherwise specified. Feed a 1600 KC signal from an external signal generator thru a .001 capacitor to the 1600 KC IF input connector. Keep the signal generator and the gain control so adjusted that no overload occurs. Peak transformers T700, T701, T702 and T703 for maximum output gradually decreasing the signal generator voltage to prevent overload.

NOTE: All RF adjustments must be made using an insulated screwdriver with as small a metal tip as possible. RF adjustments are accessible from the bottom of the tuning unit, adjacent to the tuning condenser.

1.3 RF Tuner, Band 1 (.15 - .36 MC)

Set the band switch to the .15 - .36 MC range. Feed an RF signal from an external signal generator to the antenna connector on the tuning unit. A 50 ohm unterminated line should be used for this connection. With the TUNING control and signal generator set to .36 MC, adjust RF trimmer capacitors C700, C722 and C738. Set the TUNING control and signal generator to .15 MC, and adjust the RF inductors found in transformers T708, T714 and T720. Alternately, repeat the adjustments at .15 and .36 MC as required to obtain maximum output. Reset the tuning control and signal generator to .15 MC and peak L701 for maximum output. L701 is the mixer plate inductance, and is mounted on the 455 KC IF strip.

After Band 1 has been completely aligned, check the available gain reserve at the weakest point in the calibrated band. With the SIGNAL ATTENUATOR set to 20 DB, and the GAIN control in its maximum clockwise position, approximately 10 microvolts or less should be required for a full scale meter deflection.

1.4 RF Tuner, Bands 2 through 6

The remaining bands, 2 through 6 are adjusted using the same procedure as Band 1 except that the following signals are used.

Band 2 - .36 to .87 MC (adjust L700 at .36 MC)

Band 3 - .87 to 2.1 MC

Band 4 - 2.1 to 5.2 MC

Band 5 - 5.2 to 12.7 MC

Band 6 - 12.7 to 30.0 MC

2. Tuning Unit T-1/NF-205

Remove the dust covers from the tuning unit and basic measuring unit. Remove the back plate from the detector assembly. Plug the tuning unit in and turn the power on. Before attempting to make any of the following adjustments, the equipment should be permitted to warm up for a period of not less than 15 minutes.

2.1 IF Amplifier, 10.7 MC

Set the function switch to the CW AVERAGE position, and the band switch on the tuning unit to the 20 to 65 MC range. The SIGNAL ATTENUATOR must be kept in the 20 DB position for all of the following alignment procedures unless otherwise specified. Feed a 10.7 MC signal from a signal generator to the mixer grid (Pin 2 of V10) of the 20 to 65 MC range. Keep the signal generator and the GAIN control so adjusted that no overload occurs. Peak transformers T5, T7, T8 and T9 and coil L46 for maximum output, gradually decreasing the signal generator voltage to prevent overload. Set the band switch on the tuning unit to the 65 to 200 MC range. Feed a 10.7 MC signal to Pin 2 of V13. Peak T6, without disturbing the adjustments made in the previous step. Cathode coil L47 in the output stage of the IF amplifier is not to be adjusted during this operation.

2.2 RF Tuner, 20-65 MC

All RF adjustments must be made using an insulated screwdriver with as small a metal tip as possible. Set the band switch to the 20 to 65 MC range. Feed an RF signal from the signal generator to antenna connector J7, which is the lower of the two connectors on the tuning unit panel. A 50 ohm unterminated line should be used for this connection. With the TUNING control and signal generator set to 20 MC, adjust

oscillator trimmer C84 for maximum output, and peak RF trimmers C60, C67 and C79. Set the TUNING control and signal generator to 65 MC. Do not attempt any alignment at this frequency if calibration and sensitivity appear to be satisfactory. If alignment is required, change the inductance of oscillator and inductor L26, by squeezing or spreading turns. Follow by adjusting RF end inductors L20, L22 and L24. Alternately repeat adjustments at 20 and 65 MC as required. Do not change the adjustment of oscillator shunt inductor L27 which governs the tracking across the band. After the low frequency band has been completely aligned, check the available gain reserve at the weakest point in the calibrated band. With the SIGNAL ATTENUATOR set to 20 DB and the GAIN control in its maximum clockwise position, approximately 50 microvolts should be required for full scale meter deflection.

2.3 RF Tuner, 65-200 MC

Set the band switch to the 62 to 200 MC range. Feed a 62 MC signal into the upper antenna connector (J10) on the tuning unit. Peak oscillator trimmer C117 and adjust RF trimmers C96, C101 and C109 for maximum output. Set the TUNING control to 200 MC. If alignment is required, change the inductance of the oscillator end inductor L42 by squeezing or spreading turns. Follow by adjusting RF end inductors L33, L36 and L39. Do not disturb shunt inductors L31, L34, L37 and L40 which govern the tracking. Set the TUNING control and signal generator to 200 MC. Set the SIGNAL ATTENUATOR to its 20 DB position and set the function switch to CW average. Place the ADJUST switch located directly behind the meter to the ADJUST position. Increase the signal generator output until the receiver overload point is reached. Adjust L47, the cathode follower coil on the IF chassis, for maximum output. Again increase the signal generator output until the overload point is reached and touch up L47. Tune L46 for maximum output and retouch L47.

3. Tuning Unit T-2/NF-205

Remove the dust covers from the tuning unit and the basic measuring unit and the back plate from the detector assembly. Plug the tuning unit in and turn the power on. Before attempting to make any of the following adjustments, the equipment should be permitted to warm up for a period of not less than 15 minutes.

3.1 IF Amplifier, 30 MC

The procedures outlined in paragraph 2.1 for the alignment of the 10.7 MC IF amplifier basically apply to the 20 MC IF amplifier. Disconnect IF input P203 from the RF chassis adjacent to the worm gear drive. Feed a 30 MC signal into this connector. Align transformers T1, T2 and T3 and coils L11 and L62, carefully avoiding overload. Cathode coil L16 is not to be adjusted during this operation. Reconnect the IF input plug to the RF unit and feed an RF signal of 400 MC into the antenna connector on the front panel. Carefully tune

the receiver for maximum meter deflection resulting from this signal. Peak C8 located beneath the RF chassis. Realign the IF input transformer T1 for maximum output without disturbing any of the other adjustments.

3.2 RF Tuner, 200-400 MC

Feed a signal generator output, through an unterminated 50 ohm line into the antenna connector (J201) on the front of the tuning unit. Set the TUNING control and signal generator to 400 MC. Adjust oscillator trimmer C12 for maximum output. Tune trimmer C20 while "rocking" the signal generator tuning until optimum aligment is obtained. Peak trimers C1 and C2. Set the TUNING control and signal generator to 200 MC. Adjust oscillator inductor L5 for maximum output.

NOTE: Great care must be exercised when adjusting the oscillator or RF inductors for this frequency range, since very small changes in inductor length cause relatively large frequency changes.

Loosen the nut holding the oscillator inductor to the tuning capacitor (do not unsolder the other end of the inductor), and carefully slide the inductor until maximum output is reached. Retighten the nut. Repeat the procedure until satisfactory alignment is obtained. Adjust RF plate coil L3 by loosening both nuts holding it to the tuning capacitor and slide it until the best alignment is obtained. Retighten the nuts. L3 and L4 must be spaced at approximately 1/8 inch. To move the crystal mixer, loosen the screws under the chassis and slide. When the proper coupling is obtained, retighten these screws. After changing the spacing, again check for proper inductance setting of L3. Using the same procedure, adjust L2 and space 1/16 inch to L1. Set the TUNING control and signal generator to 200 MC. Set the SIGNAL ATTENUATOR to 20 DB and the function switch to CW AVERAGE. Place the adjust switch located behind the meter to the ADJUST Position. Increase the signal generator output until the receiver overload point is reached. Now adjust L16, the cathode follower coil on the IF chassis, for maximum output. Again increase the signal generator output until the overload point is reached and touch up L16. Tune L11 for maximum output and retouch L16.

4. Tuning Unit T-3/NF-205

Remove the dust covers from the tuning unit and basic measuring unit. Remove the back plate from the detector assembly. Plug the tuning unit in and turn the power on. Before attempting to make any of the following adjustments, the equipment should be permitted to warm up for a period of not less than 15 minutes.

4.1 IF Amplifier, 42 MC

The procedures outlined in paragraph 2.1 for the alignment of the 10.7 MC IF amplifier basically apply to the 42 MC IF amplifier.

Disconnect IF connector P601. This is located next to the tuning adjustment for T601 on the small IF chassis at the rear of the frame. With band switch on 400 to 700 range, feed a 42 MC signal into J601 and align transformers L619, L623, L624 L625, L626 and L627, being careful to avoid overload. Peak coil L628 under overload conditions as explained in paragraph 2.1. Reconnect IF connector P601 to J601. Feed an RF signal of 400 MC into the 400-700 MC input connector on the front panel. Turn the bandswitch to the 400-700 MC position, and adjust the TUNING control about the 400 MC mark for maximum output. Readjust L619 for maximum output without disturbing any of the other adjustments.

4.2 RF Tuner, 400-700 MC

It must be kept in mind that the circuits in this tuning unit are very critical so that small changes in inductance or capacity will produce large changes in tuning and thus in tracking and sensitivity. It is important, therefore, that no adjustments be made until it is determined that they are absolutely necessary, and then they must be made with the utmost care. Set the band switch to 400-700 MC. Feed an RF signal to input connector J605, which is the lower of two connectors on the front panel. The signal generator should be isolated by a 50 ohm pad of at least 6 DB attenuation. With the SIGNAL ATTENUATOR in the 20 DB position, and the GAIN control maximum clockwise, set the signal generator output to 100 microvolts, tune the receiver and generator to check points at approximately 50 MC intervals. If the meter indication is full scale or off scale at all check points, the system gain is satisfactory. Set the signal attenuator to 0-SUBST. ONLY, and the signal generator to 10 microvolts. At several check frequencies, reduce the GAIN until the signal generator output produces a full scale reading. Shut off the signal generator. The residual noise as indicated by the meter should not be in excess of 4 microvolts. If the tuner does not comply with these limits, proceed as follows: Set the signal generator to 700 MC and adjust the TUNING control for maximum output. The RF and mixer circuits may be peaked by adjusting the trimmer strips located under the tuning lines. Since this operation may disturb the low frequency adjustment, it is necessary to check both ends of the band several times to insure optimum performance. Set the signal generator to 400 MC, adjust the TUNING control for maximum output. To align the RF and mixer circuits, bend their condenser plates for maximum signal indication. After completing this alignment procedure, select the weakest point in the frequency range. Adjust L618 for maximum output.

4.3 RF Tuner, 700-1000 MC

This tuner is adjusted in the same manner as outlined in paragraph 4.2 above. Use alignment frequencies of 700 and 1000 MC, and adjust L640 for maximum output.

Section VI

Repair Instructions

1. General

The procedures employed in repairing this equipment are largely conventional as far as the electronic circuits are concerned. It is the purpose of these instructions to point out unusual procedures that might be helpful in making repairs. Such instructions are considered desirable for the following units.

a. Impulse Generator

b. Gear Trains

2. Impulse Generator

If no output pulse is obtained, check the following with the attenuator dials adjusted for maximum output.

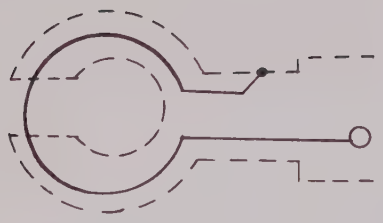
a. The voltage at the charging line (top of pulse forming network) should be approximately 450 volts DC. If no voltage is present, check switch contacts, OA-2 tubes or selenium rectifiers.

b. A buzzing sound should be heard in the pulse forming network. If this sound is not observed, check the coild driving voltage which should be 5 V pulsating DC.

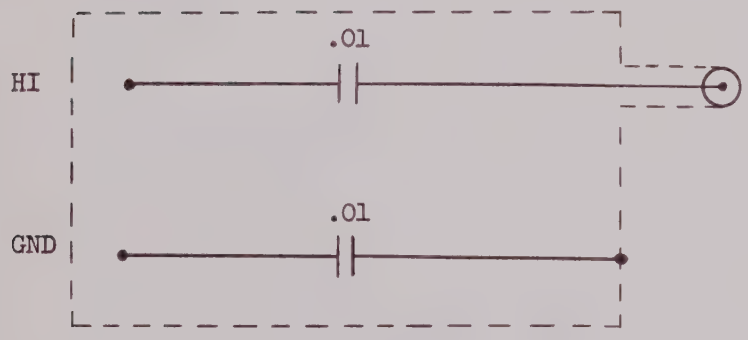
CAUTION: The pulse forming network utilizes a glass cartridge containing mercury under pressure: No attempt should be made to open it.

3. Gear Trains

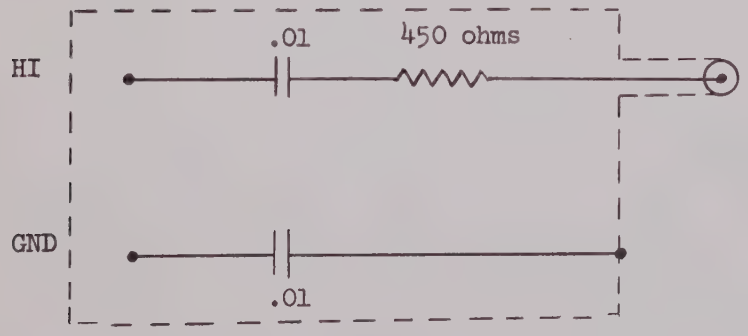
The gear trains used in the tuning units incorporate a clutch in order to prevent any damage to the tuning elements, should the tuning control be inadvertently turned past its end settings. In order to reset the clutch if it should become loose, first remove the tuning unit from its dust cover. Looking in from the side of the unit, a spring washer will be seen on the drive shaft. A collar controls the tension on this spring, and thus the clutch action. Loosen the two Allen set screws which hold the collar to the shaft. With a screwdriver, move the collar toward the spring. Gently pressing with the screwdriver will increase the clutch tension. When the desired tension is obtained, retighten the two Allen set screws.



Magnetic Field Probe (Red)
LO-205

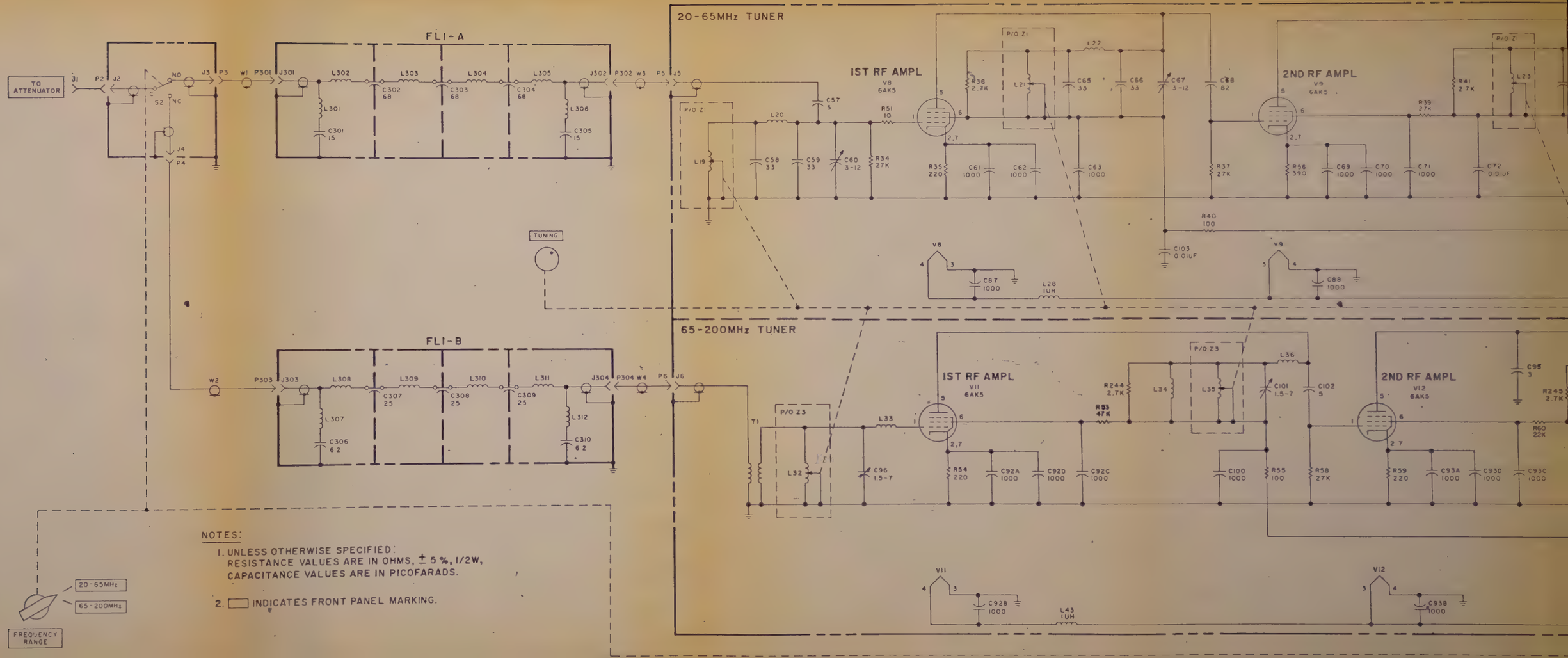


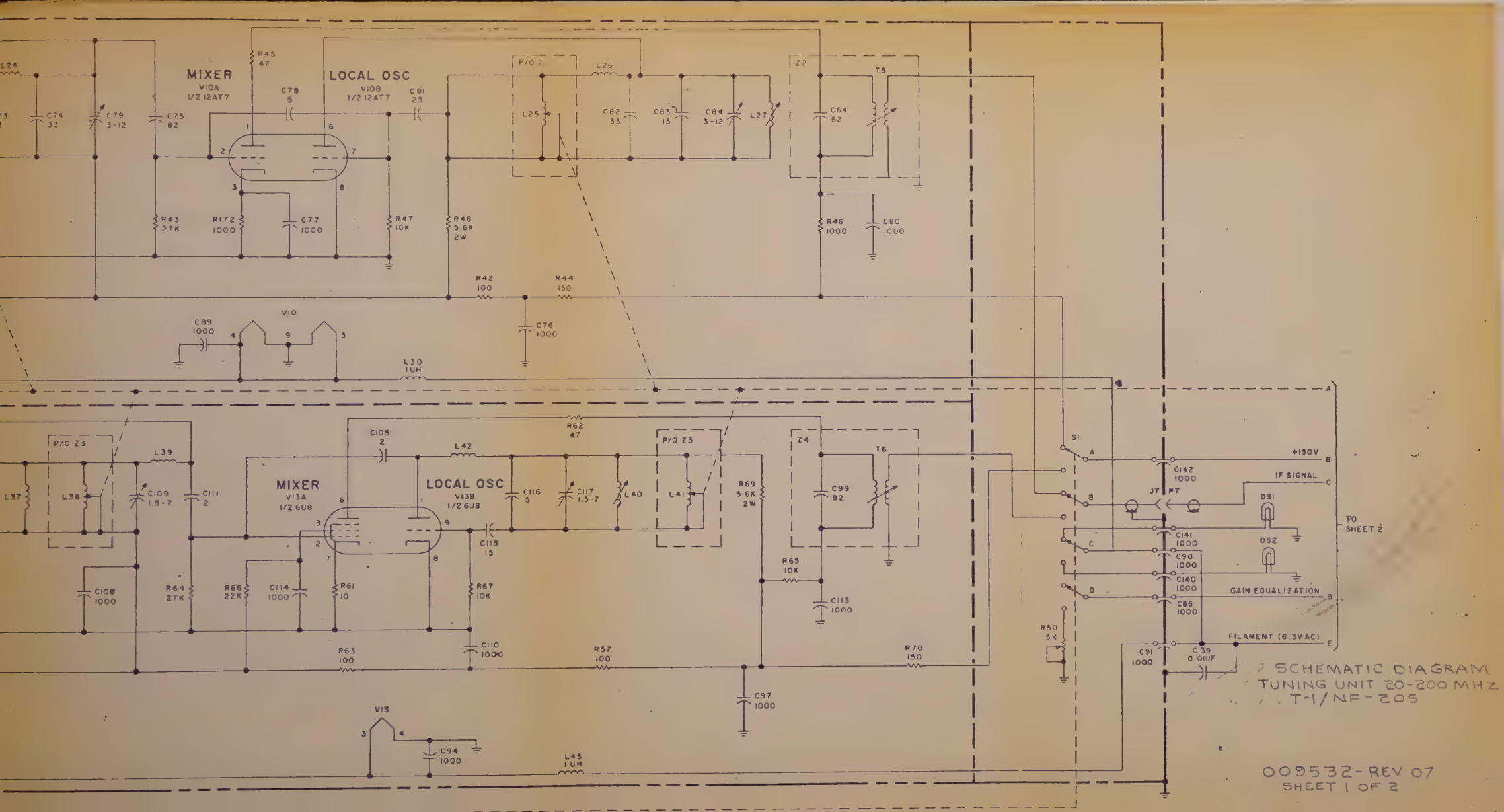
Line Probe - 50 ohms
LA-205



Line Probe - 500 ohms
LF-205

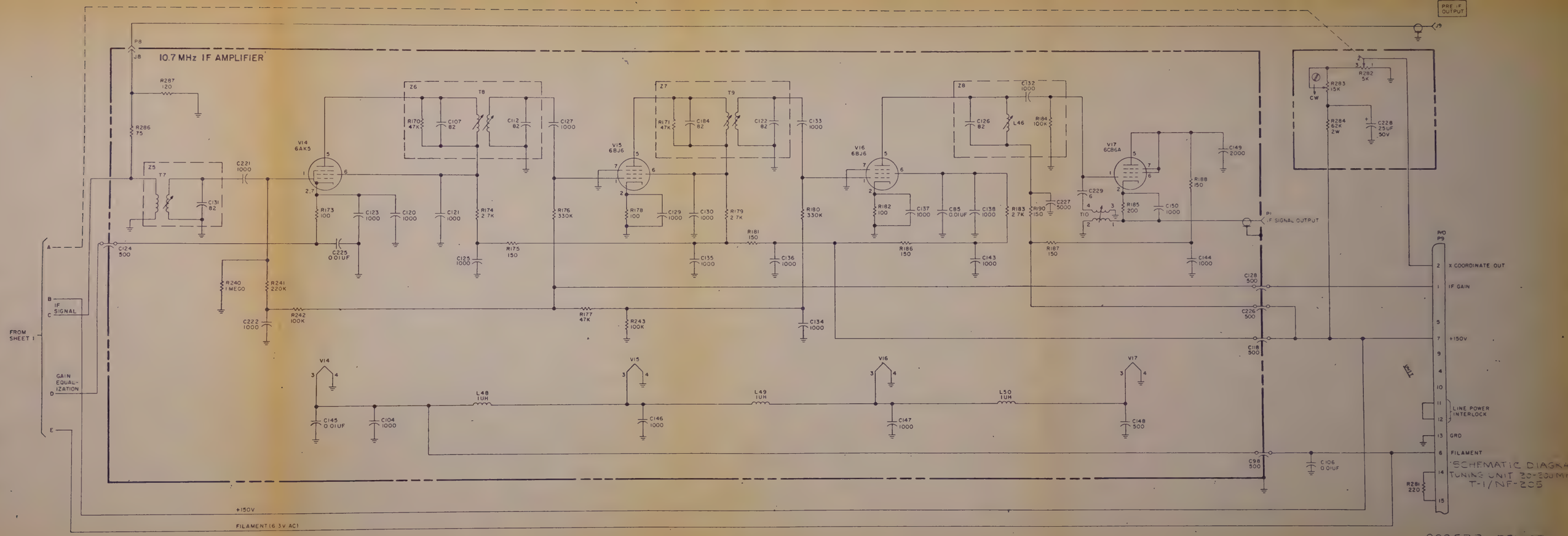
Schematic Diagram
150 KC - 30 MC Probes
(Part of Antenna
Equipment LM-205)

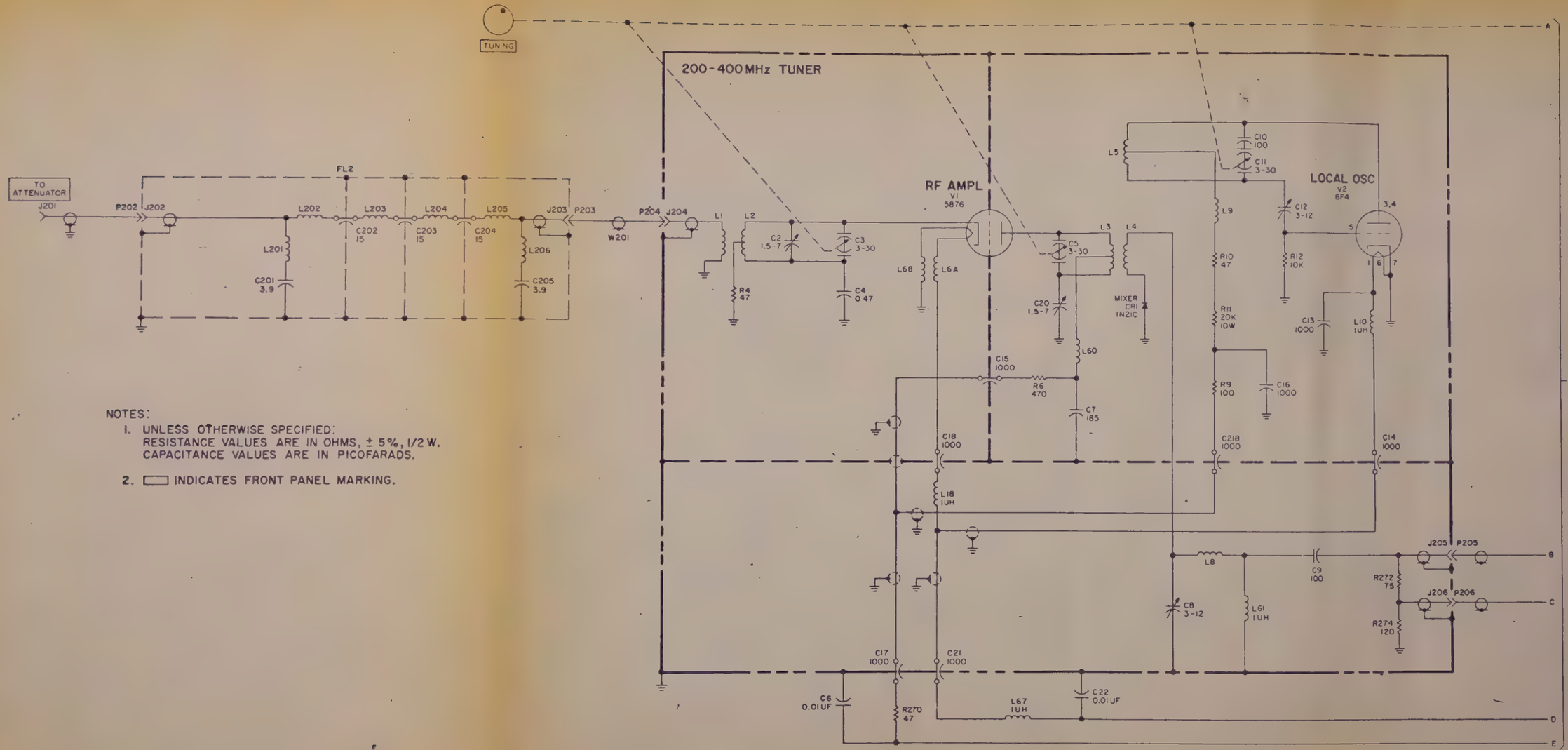

20-65MHz TUNER
FLI-A
TO ATTENUATOR
J1
P2
J2
S2
NO
NC
J3
P3
W1
P301
J301
L302
L303
L304
L305
J302
P302
W3
P5
J5
L301
C301 15
C302 68
C303 68
C304 68
L306
C305 15
J4
P4
IST RF AMPL
V8 6AK5
P/O Z1
L20
C57 5
R51 10
L19
C58 33
C59 33
C60 3-12
R34 27K
R35 220
C61 1000
C62 1000
C63 1000
R36 2.7K
L21
C65 33
C66 33
C67 3-12
L22
C68 82
2ND RF AMPL
V9 6AK5
R41 2.7K
L23
R39 27K
R37 27K
R56 390
C69 1000
C70 1000
C71 1000
C72 0.01UF
R40 100
C103 0.01UF
V8
C87 1000
L28 1UH
V9
C88 1000
TUNING
FLI-B
W2
P303
J303
L308
L309
L310
L311
J304
P304
W4
P6
J6
L307
C306 6.2
C307 25
C308 25
C309 25
L312
C310 6.2
65-200MHz TUNER
IST RF AMPL
VII 6AK5
P/O Z3
T1
L33
L32
C96 1.5-7
R54 220
C92A 1000
C92D 1000
C92C 1000
R53 47K
R244 2.7K
L34
L35
L36
C101 1.5-7
C102 5
C100 1000
R55 100
R58 27K
2ND RF AMPL
VI2 6AK5
C95 3
R245 2.7K
R60 22K
R59 220
C93A 1000
C930 1000
C93C 1000
VII
C928 1000
L43 1UH
VI2
C938 1000
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
RESISTANCE VALUES ARE IN OHMS, ± 5%, 1/2W,
CAPACITANCE VALUES ARE IN PICOFARADS.
2. ☐ INDICATES FRONT PANEL MARKING.
20-65MHz
65-200MHz
FREQUENCY RANGE



SCHEMATIC DIAGRAM
TUNING UNIT 20-200 MHZ
T-1/NF-205

009532-REV 07
SHEET 1 OF 2


10.7 MHz IF AMPLIFIER
PRE IF OUTPUT
J9
P8
J8
R287 120
R286 75
Z5
T7
C221 1000
C131 82
V14 6AK5
Z6
T8
R170 47K
C107 82
C112 82
C127 1000
R173 100
C123 1000
C120 1000
C121 1000
R174 2.7K
C125 1000
C225 0.01UF
R175 150
R176 330K
V15 6BJ6
Z7
T9
R171 47K
C184 82
C122 82
C133 1000
R178 100
C129 1000
C130 1000
R179 2.7K
C135 1000
R181 150
C136 1000
R180 330K
V16 6BJ6
Z8
C132 1000
C126 82
L46
R184 100K
R182 100
C137 1000
C85 0.01UF
C138 1000
R183 2.7K
R190 150
C227 5000
R186 150
C143 1000
R187 150
V17 6CB6A
C149 2000
C229 6
T10
R185 200
C150 1000
R188 150
C144 1000
R282 5K
R283 15K
CW
R284 62K 2W
C228 25UF 50V
P1
IF SIGNAL OUTPUT
P10
P9
2 X COORDINATE OUT
1 IF GAIN
5
7 +150V
9
4
10
11 LINE POWER INTERLOCK
12
13 GRD
6 FILAMENT
14
15
C124 500
R240 1 MEGO
R241 220K
C222 1000
R242 100K
R177 47K
R243 100K
C134 1000
C128 500
C226 500
C118 500
C98 500
C106 0.01UF
R281 220
FROM SHEET 1
A
B IF SIGNAL
C
GAIN EQUALIZATION
D
E
L48 1UH
L49 1UH
L50 1UH
C145 0.01UF
C104 1000
C146 1000
C147 1000
C148 500
+150V
FILAMENT (6.3V AC)
SCHEMATIC DIAGRAM
TUNING UNIT 20-230MHz
T-1/NF-205
009532-REV 07
SHEET 2 OF 2

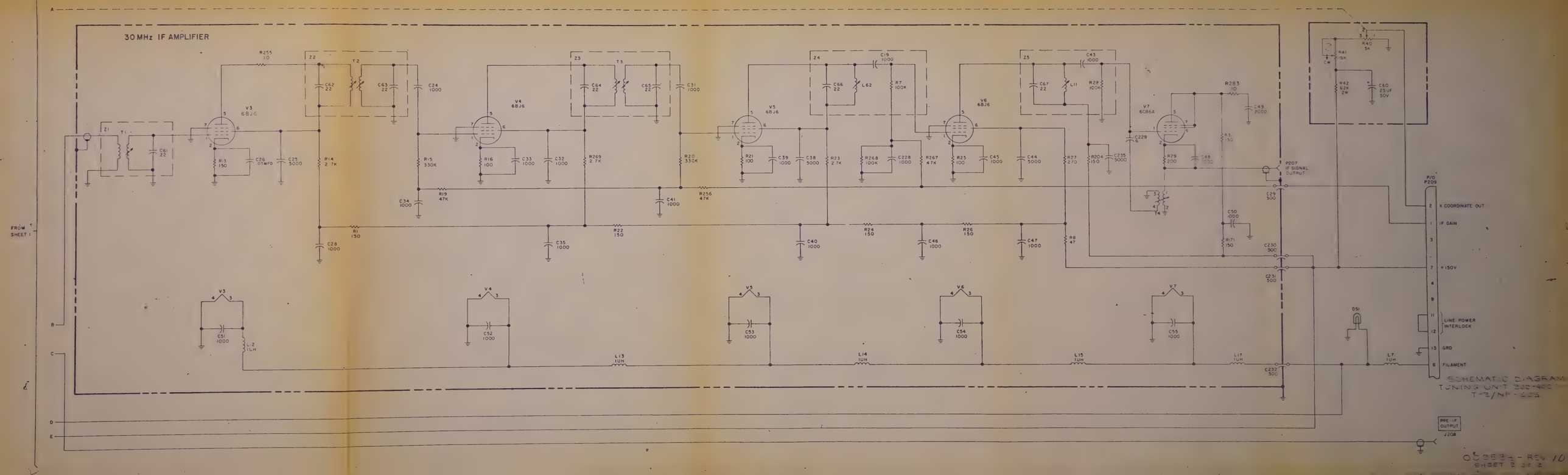


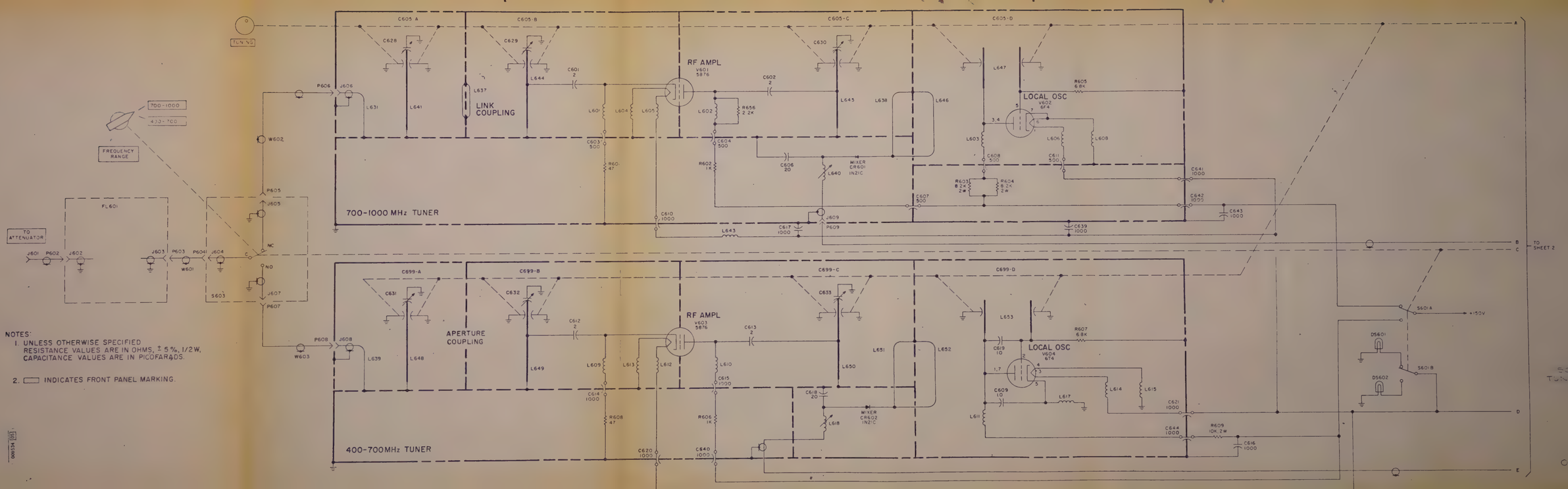
NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   RESISTANCE VALUES ARE IN OHMS, ± 5%, 1/2 W.
   CAPACITANCE VALUES ARE IN PICOFARADS.
2. ▭ INDICATES FRONT PANEL MARKING.

SCHEMATIC DIAGRAM
TUNING UNIT 200-400MC
T-2/NF-205

CO 534-REV 10
SHEET 1 OF 2


30 MHz IF AMPLIFIER
FROM SHEET 1
V3 6BJ6
V4 6BJ6
V5 6BJ6
V6 6BJ6
V7 6CB6A
R255 10
R14 2.7K
R15 330K
R19 47K
R269 2.7K
R20 330K
R256 47K
R1 150
R22 150
R24 150
R26 150
R8 47
R283 10
R40 5K
R41 10K
R42 62K 2W
C60 25UF 50V
C24 1000
C31 1000
C19 1000
C43 1000
C49 2000
C48 1000
C50 .001
R171 150
C29 500
C230 500
C231 500
C232 500
P207 IF SIGNAL OUTPUT
P/O P209
2 X COORDINATE OUT
1 IF GAIN
7 +150V
11 LINE POWER INTERLOCK
12
13 GRD
6 FILAMENT
D51
L7 1UH
L13 1UH
L14 1UH
L15 1UH
L17 1UH
L2 1UH
PRE IF OUTPUT J208
SCHEMATIC DIAGRAM TUNING UNIT 2100-4000 MC T-2/NP-205
05253A-REV 10
SHEET 2 OF 2



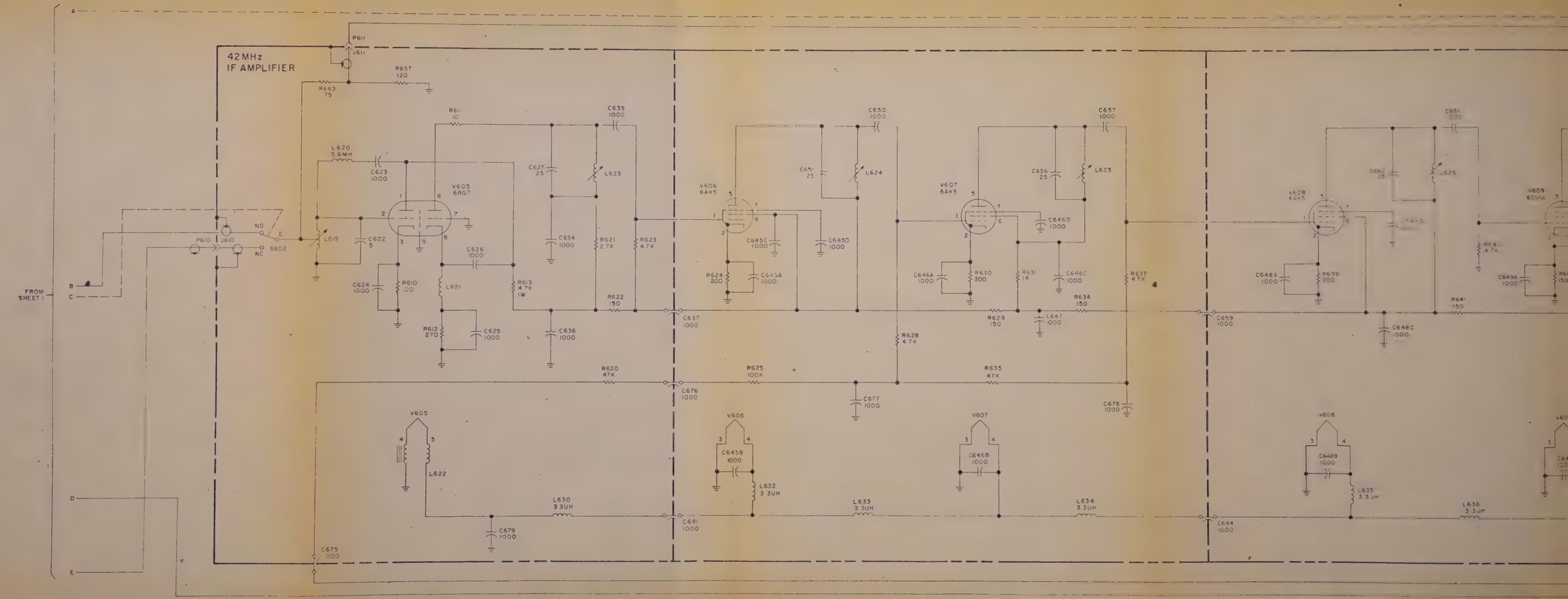
NOTES:

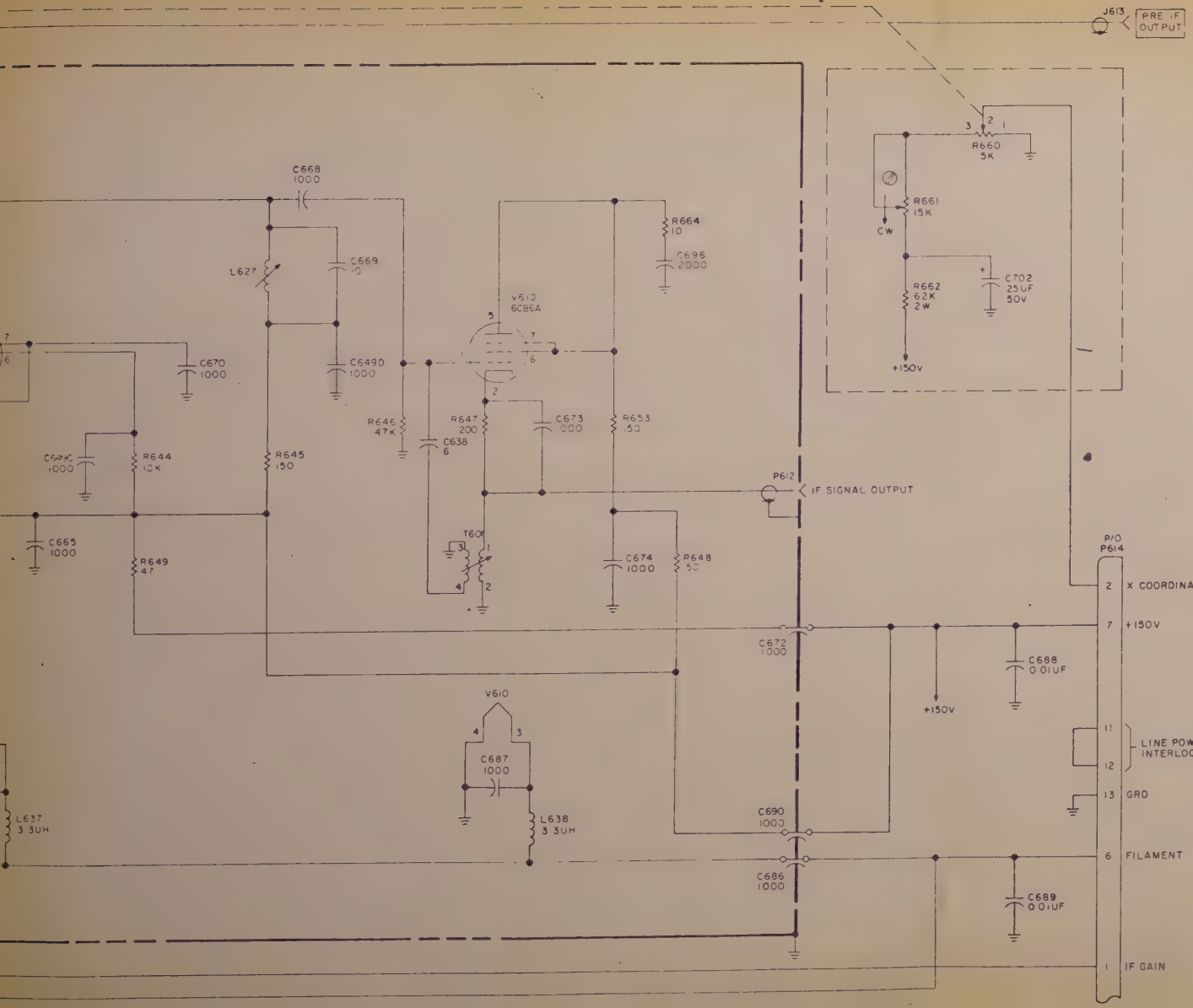
1. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS, ± 5%, 1/2W, CAPACITANCE VALUES ARE IN PICOFARADS.
2. ▭ INDICATES FRONT PANEL MARKING.

SCHEMATIC DIAGRAM
TUNING UNIT 400-1000MHz
T-3/NF-20

009534-REV 07
SHEET 1 OF 2

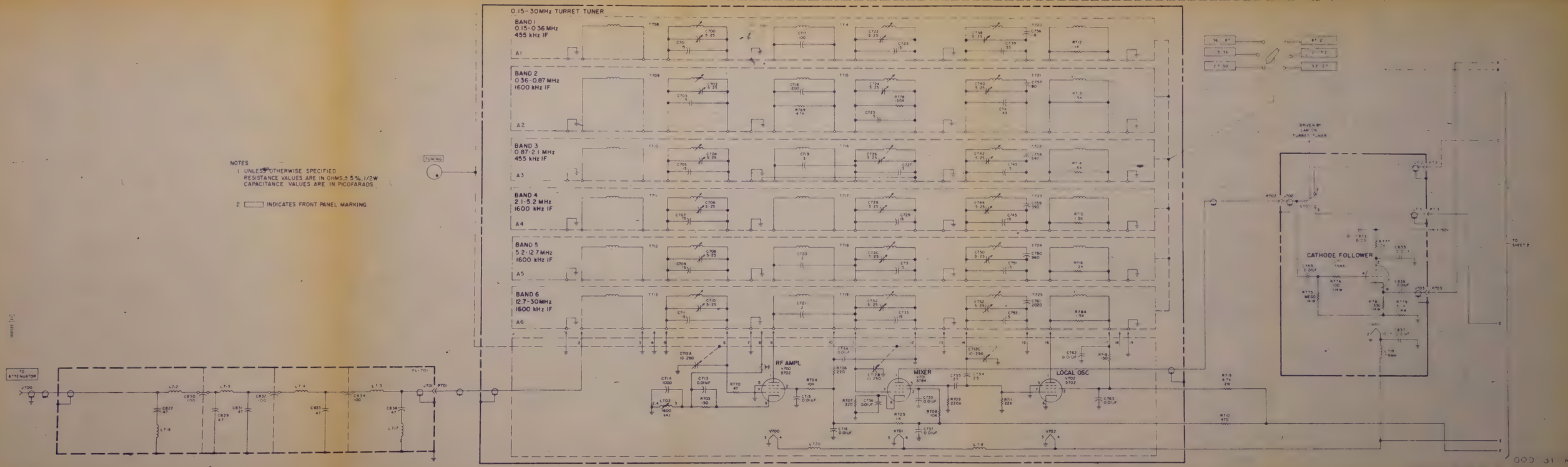
009534 [05]

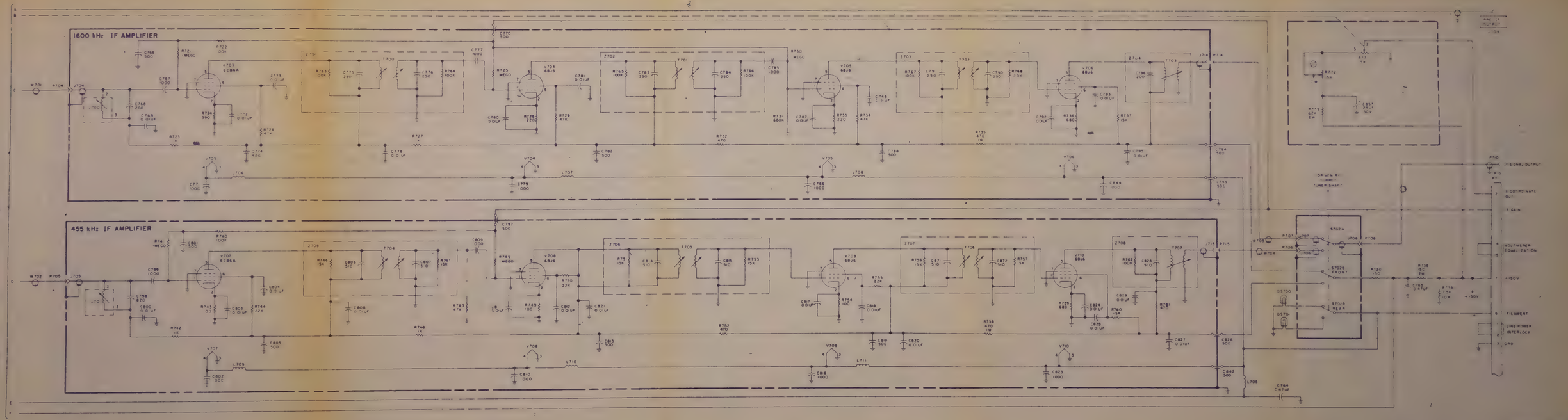

42MHz
IF AMPLIFIER
FROM SHEET 1
P611
J611
R657 120
R653 75
R611 10
C635 1000
L620 5.6MH
C623 1000
V605 6BQ7
C627 25
L623
C634 1000
R621 2.7K
R623 4.7K
P610
J610
NO
NC
C
S602
L619
C622 5
C626 1000
C624 1000
R610 100
L621
R613 4.7K 1W
R612 270
C625 1000
C636 1000
R622 150
C637 1000
C650 1000
C651 25
L624
V606 6AK5
C645C 1000
C645D 1000
R624 200
C645A 1000
C657 1000
C656 25
L625
V607 6AK5
C646D 1000
C646A 1000
R630 200
R631 1K
C646C 1000
R637 47K
R629 150
C647 000
R634 150
R628 4.7K
C659 1000
C661 000
L626
V608 6AK5
V609 6BH6
C648A 1000
P639 200
C648C 000
R641 150
C649A 1000
R620 47K
R625 100K
R635 47K
C676 1000
C677 1000
C678 1000
V605
L622
V606
C645B 1000
L632 3.3UH
V607
C646B 1000
V608
C648B 1000
L635 3.3UH
L636 3.3UH
L630 3.3UH
L633 3.3UH
L634 3.3UH
C679 1000
C681 1000
C684 1000
C675 000
A
B
C
D
E
F



SCHEMATIC DIAGRAM
TUNING UNIT 400-1000 MHZ
T-3/NF-205

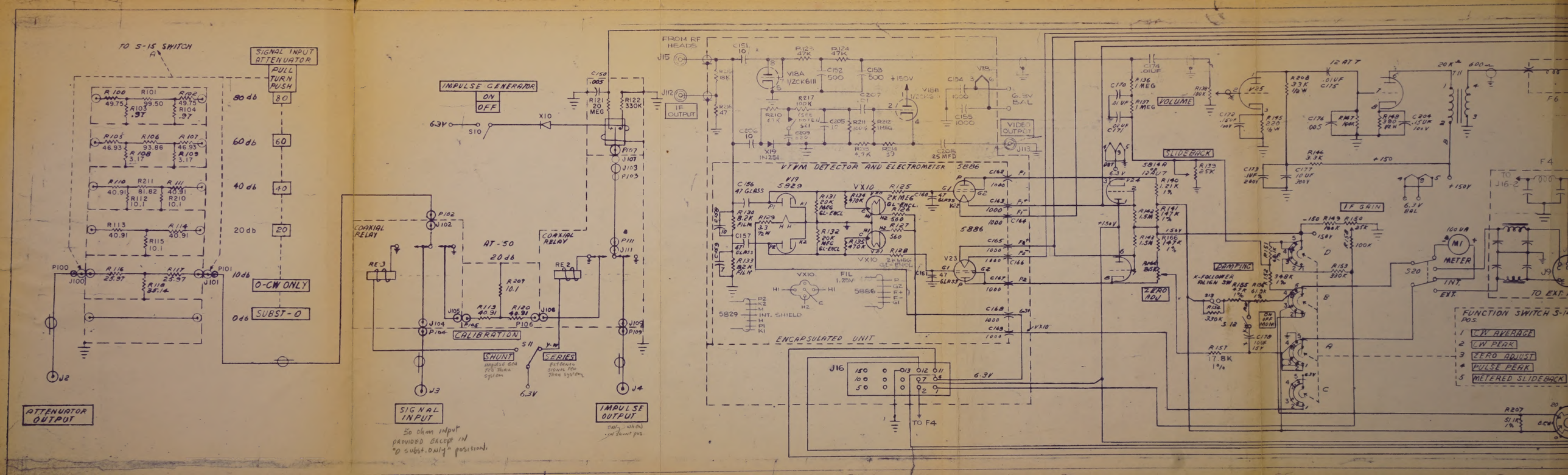
009534-REV 07
SHEET 2 OF 2

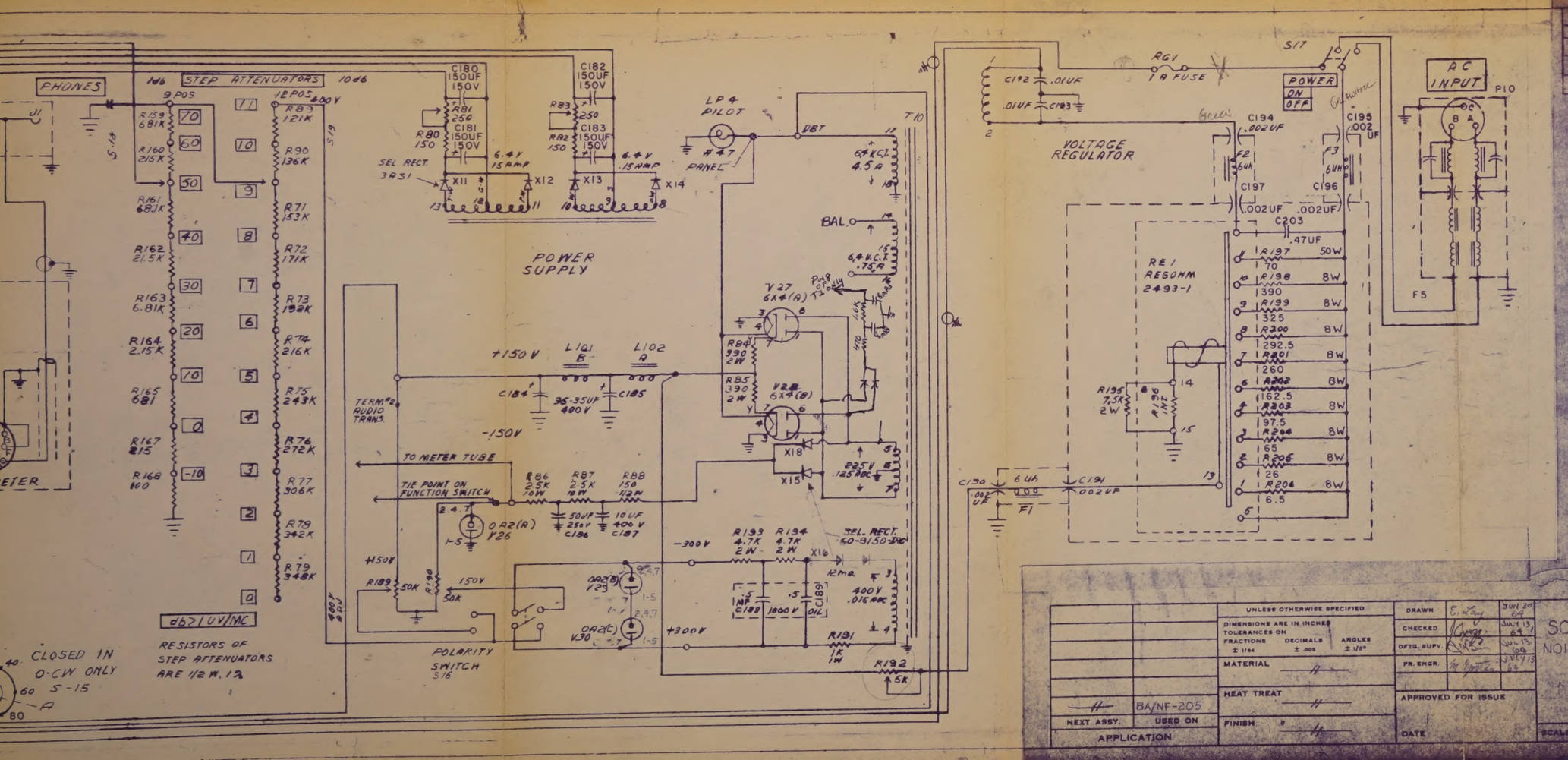

0.15-30MHz TURRET TUNER
BAND 1
0.15-0.36 MHz
455 kHz IF
A1
BAND 2
0.36-0.87 MHz
1600 kHz IF
A2
BAND 3
0.87-2.1 MHz
455 kHz IF
A3
BAND 4
2.1-5.2 MHz
1600 kHz IF
A4
BAND 5
5.2-12.7 MHz
1600 kHz IF
A5
BAND 6
12.7-30MHz
1600 kHz IF
A6
TUNING
NOTES
1 UNLESS OTHERWISE SPECIFIED
RESISTANCE VALUES ARE IN OHMS, ± 5%, 1/2W
CAPACITANCE VALUES ARE IN PICOFARADS.
2 INDICATES FRONT PANEL MARKING
TO ATTENUATOR
FL-701
RF AMPL
V700
5702
MIXER
V701
5784
LOCAL OSC
V702
5702
DRIVEN BY CAM IN TURRET TUNER
CATHODE FOLLOWER
V703
6AB8
TO SHEET 2
TUNING UNIT TA/NF-205 (Sheet 1 of 2)
003 31 REV



009571 REV H

TUNING UNIT TA/RF-205 (Sheet 2 of 2)


TO S-15 SWITCH
A
SIGNAL INPUT ATTENUATOR
PULL TURN PUSH
80 db
60 db
40 db
20 db
10 db
0 db
80
60
40
20
O-CW ONLY
SUBST-O
R 100
R101
R102
49.75
99.50
49.75
R103 .97
R104 .97
R105
R106
R107
46.93
93.86
46.93
R108 3.17
R109 3.17
R110
R211
R111
40.91
81.82
40.91
R112 10.1
R210 10.1
R113
R114
40.91
40.91
R115 10.1
R116 25.97
R117 25.97
R118 85.14
P100
J100
P101
J101
J2
ATTENUATOR OUTPUT
IMPULSE GENERATOR
ON
OFF
6.3V
S10
X10
C150 .005
R121 20 MEG
R122 330K
P107
J107
J103
P103
P111
J111
J112
IF OUTPUT
P102
J102
COAXIAL RELAY
RE-3
AT-50
20 db
R209 10.1
COAXIAL RELAY
RE-2
J105
R113 40.91
R120 40.91
J106
P106
J104
P104
CALIBRATION
S11
SHUNT
SERIES
6.3V
J108
P108
J109
P109
J3
J4
SIGNAL INPUT
50 ohm input provided except in "0 subst. only" position.
IMPULSE OUTPUT
Carry 2 ohms in shunt pos.
FROM RF HEADS
J15
C151 10
R216 18K
R216 47
V18A 1/2CK611
R123 47K
R124 47K
C152 500
C153 500
+150V
R217 100K VVV (SEE NOTE 1)
R210 47K
C209 .20
C205 .10
R211 100K
R212 1MEG
R215 4.7K
R214 33
C205 .25 MFD
X19 IN251
C206 10
V18B 1/2CK611
V18
C154 1000
C155 1000
6.3V BAL
VIDEO OUTPUT
J113
VTVM DETECTOR AND ELECTROMETER 5886
V19 5829
C156 .47 GLASS
R130 8.2K FILM
R129 3.3 1/2W
C157 .47 GLASS
R133 8.2K FILM
VX10
R125 2K MEG GL-ENCL.
R134 470K
R131 20K MEG GL-ENCL
R132 20K MEG GL-ENCL
R135 470K
R127 560
R128 2K MEG GL-ENCL
V21
V23
5886
C161 .47 GLASS
C162 1000
C163 1000
C164 1000
C165 1000
C166 1000
C167 1000
C168 1000
C169 1000
VX10
FIL 1.25V
5829
INT. SHIELD
ENCAPSULATED UNIT
J16
150
100
50
6.3V
TO F4
C174 .01UF
C170 .01UF
R136 1 MEG
R137 1 MEG
VOLUME
C171 .01UF
R138 100K
V25
12 AT 7
R208 33K 1/2W
C175 .01UF
R195 220 1/2W
C172 .15UF 1KV
C176 .005
RM7 10K
RM8 380 1W
C204 .15UF 10KV
20K
600Ω
F6
R146 3.3K
C173 .1UF 20KV
C177 10 UF 20KV
+150
+150V
SLIDEBACK
5814A 12AU7
R139 25K
R140 1.21K 1%
V24
R141 1.5M
R142 1.5M
R143 1.5M
R166 1.47K 1%
R144 85K
ZERO ADJ
CLAMPING
K-FOLLOWER ALIGN SW
R155 47K 1%
R156 61.3K 1%
R154 330K
S13
S 18
ON OFF MOM
C178 10UF 15V
R157 17.8K 1%
A
B
C
D
I.F. GAIN
-150
R149 25K
R150 100K
R161 348K 1%
R153 330K
S20
100 UA
M1
METER
INT.
EXT.
TO J16-2
TO EXT.
F4
FUNCTION SWITCH S-18
POS.
1 CW AVERAGE
2 CW PEAK
3 ZERO ADJUST
4 PULSE PEAK
5 METERED SLIDEBACK
R207 511 1%
CCW



REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
00	RELEASED	10/26/66	
01	REVISED PER ECN 4247	10/26/66	
02	REVISED PER ECN 4888	4/9/67	

HIGHEST REF DES USED			
R217	C209	X19	J113
S21			

NOTES: UNLESS OTHERWISE SPECIFIED
1. S21 IS MECHANICALLY ACTUATED WHEN SPECIALLY MARKED TV-FTA TUNING UNITS ARE INSERTED INTO NF-205 BASIC UNIT CAVITY. THESE TUNING UNITS ARE IDENTIFIED WITH A RED DOT ON THE RIGHT SIDE DUST COVER PANEL.

UNLESS OTHERWISE SPECIFIED		DRAWN	JUN 30 66
DIMENSIONS ARE IN INCHES		CHECKED	JULY 13 67
TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2°		DFTG. SUPV.	JUL 13 67
MATERIAL		PR. ENGR.	JUL 13 67
HEAT TREAT		APPROVED FOR ISSUE	
FINISH		DATE	
NEXT ASSY. BA/NF-205	USED ON	SCALE	
APPLICATION			

SCHEMATIC DIAGRAM
NOISE & FIELD INTENSITY METER
MAIN CHASSIS
BA/NF-205

SINGER METRICS
THE SINGER MANUFACTURING COMPANY
BRIDGEPORT, CONN.

REV. 02 CODE 10d6-0074 SHEET 1 OF 1